SURGERY, GYNECOLOGY AND OBSTETRICS

AN INTERNATIONAL MAGAZINE, PUBLISHED MONTHLY

VOLUME VI FEBRUARY, 1908 NUMBER 2

CHRONIC CONSTIPATION

A CONSIDERATION OF ITS SURGICAL TREATMENT

BY W. ARBUTHNOT LANE, M. S., F. R. C. S.
Surgeon to Guy's Hospital; Senior Surgeon Hospital for Sick Children, London

THE term "chronic constipation," as generally used, does not include all the conditions which I intend it should in this communication. They are the consequences of the accumulation of material in the intestinal tract for a period considerably in excess of the normal. While in the large majority of cases this is associated with very infrequent hard motions, in a small proportion the motions are loose and frequent. This is particularly the case when the dilated and obstructed colon has been infected by organisms other than those that exist normally in it, with the consequent development of mucous, membranous and ulcerative colitis in their various forms. I thought of substituting for "chronic constipation" the term "chronic intestinal stasis", but there are many objections to doing so. I am, therefore, retaining the title, fully conscious that it is not sufficiently explanatory, for the reason that I do not know a better one to describe the pathological sequence to which I wish to call attention.

The subject of defective evacuation of the contents of the gastro-intestinal tract which I bring before your notice is of the greatest importance and interest, and, owing to the varying severity of the conditions consequent on this, there must be wide room for difference of opinion as to the advisability of surgical interference, as to the exact nature of such operative measures, should they be considered advisable or necessary, and as to the benefit likely to result from them.

Still, however our opinions may differ as to the treatment called for in any particular case, there can be no doubt that the pathological changes which are present in these conditions of imperfect drainage are most obvious and important. Any mechanical interference with the functions of the gastro-intestinal tract is far-reaching in its capacity for harm, and once the mechanism of the intestines has deviated materially from the normal, such alterations, together with the evil results consequent upon them, can be met only very partially even by extensive surgical measures.

In order that we may be in a position to discuss their treatment, we should understand clearly their mechanics, and I propose to describe them as clearly and as briefly as I can. You may not accept my description of these changes as accurate, or, if you allow their existence, you may regard the explanation given of their causation as incorrect. Yet I am sure that when your attention is called to them, if you have not already done so, you will take the first opportunity of testing their accuracy in the living body, and will not be merely satisfied to say that you have not previously observed them and that therefore you doubt their existence. Their presence or absence is capable of absolute demonstra-

tion. As to whether the nature of their causation as described is correct or not, I must leave to your judgment.

THE ALTERATIONS UNDERGONE BY THE GASTRO-INTESTINAL TRACT

The earliest and most conspicuous changes take place in the large intestine, which is practically the cesspool of the system, and these are most apparent in the first instance in its caecal portion and gradually extend to its termination.

The caecum becomes dilated and elongated, so much so that, when distended, it occasionally occupies the entire pelvis, displacing and compressing the viscera which normally occupy this space.

The portion of the caecum above the brim of the pelvis, together with the ascending colon, is retained in a position of abnormal fixity to the posterior wall of the abdomen. This is affected by the development of adhesions between the outer aspect of the large bowel and the peritoneum covering the abdominal wall in its vicinity. In advanced cases these adhesions are supplemented by a mesentery in which vessels of some size are contained. As a rule these adhesions merely fix the bowel, but occasionally they constrict its lumen very materially in one or more situations and render it liable to become obstructed. Not only do the adhesions anchor this part of the large bowel, but they also bind down to the iliac fossa a proportion of the appendix. They usually attach about a third or a half of its proximal portion, often terminating below in an abrupt, free margin, or forming a pucker in its normal mesentery. The acquired mesentery of the appendix is often distinct from its normal mesentery, while at other times it is intimately adherent to it. It becomes progressively shorter from its proximal to its distal limit, fixing this portion of the appendix so that its distal portion is more or less abruptly flexed upon its proximal part. In this manner the proximal portion of the appendix becomes part of the anchor or ties which oppose the downward displacement of the caecum and performs the function of a ligament, a purpose it was never evolved to perform.

A glance at this diagram (Fig. 1) explains the mechanics of the condition: 1 represents

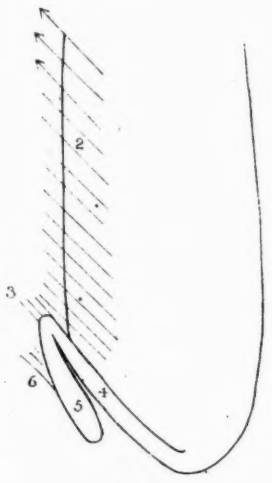


Fig. 1.

the lower end of the caecum, which is shown in a distended condition; 2 the adhesions or mesentery fixing and retaining the caecum; 3 the continuation of 2, fixing the proximal portion of the appendix; 4 the proximal portion of the appendix dragged upon by the distended caecum and fixed by a progressively shortening acquired mesentery; 5 the distal portion of the appendix distended because of the obstruction which exists at the junction with the proximal part, and 6 the lower part of the normal mesentery of the appendix.

The result of this arrangement is that, when the caecum is loaded, it exerts a vertical strain upon the proximal portion of the appendix and causes that structure to become flexed abruptly at the lower limit of its adhesions. For the time being its lumen may be reduced or occluded at the junction of the distal and mobile portion with the fixed proximal part. The secretions of the former are dammed up, and an inflammation of the appendix of varying intensity is produced. The habitual obstruction to the escape of the excretions from a greater or shorter length of the appendix leads frequently to the formation of a solid mass of epithelial and other debris which may produce much harm by its presence.

Though the above is the common mode of fixation of the appendix, there are, however,

other varieties. For instance, if the distension of the caecum occurs at an early period of life, before its descent in the abdomen to the situation it subsequently occupies, the much elongated appendix may lie vertically behind the ascending colon and caecum, its upper extremity reaching high up into the loin posteriorly, being fixed by and involved in the acquired adhesions which bind down the outer wall of the ascending colon and caecum to the abdominal wall. Or adhesions may not form with sufficient rapidity or of sufficient strength to prevent the descent of the caecum into the pelvis. In this case the appendix also escapes fixation above the pelvic brim. When, however, the caecum becomes extended and inflamed, the appendix shares in the process and acquires adhesions in the true pelvis, which interfere with its mobility and result in occlusion of its lumen with its consequences. In such conditions the right tube and ovary are not uncommonly implicated. These variations of the caecum and appendix have been incorrectly described as retroversions to ancestral types, anatomical variations, etc.

The upper limit of the ascending colon is abnormally fixed, and occupies a higher position than in the healthy subject. This is produced by the contraction of an acquired band of peritoneal adhesions which drag upon the flexure and help to oppose the downward displacement of the large bowel. This anchoring band is attached to the kidney and to the abdominal wall immediately external to it, the flexure being bound to them more closely and rigidly than normal. The increased intimacy of relationship of this viscus to the kidney and to the ilio-hypogastric, ilio-inguinal and last dorsal nerves is also of importance clinically.

Associated with the fixation of the caecum and ascending colon and the consequent limitation in its free functioning there is much wasting of the involuntary muscle wall.

The transverse colon forms a loop with its convexity downwards, and the limit to which this descends varies. A portion of the loop frequently occupies the true pelvis, reaching quite to its floor where it disputes possession of that cavity with the caecum which has usually occupied it previously.

The descent of the transverse colon increases the sharpness of the angle formed by the ascending colon with its proximal or descending limb, and also that formed by its ascending limb with the descending colon. The splenic flexure is also dragged upwards and backwards in an abnormal manner by a hypertrophy and contraction of the pleuro-colic fold, supplemented by other peritoneal bands of new formation, developed with the object of supporting the strain on this flexure exerted by the loaded transverse colon in the erect position of the trunk.

Where the descending limb of the transverse colon comes into contact with the ascending colon and caecum, adhesions retain them directly, while below a mesentery of variable breadth connects them indirectly. The same formation exists on the left side between the ascending loop of the transverse colon and the descending colon.

The presence of these mesenteries and adhesions renders any return of the transverse colon to its normal level impossible, while its further descent is favoured by their progressive contraction.

The descending colon is fixed in a manner similar to the ascending colon by adhesions and mesenteries attaching its outer surface to the peritoneum covering the adjacent abdominal wall.

I have illustrated diagrammatically in Figs. 2 and 3 this process of progressive fixation of the large bowel. The first figure represents a transverse section of the ascending colon or of the upper part of the caecum, the line B indicating the peritoneum covering the gut and the adjacent portion of the abdominal wall external to it, while the line A shows the position of the muscular and mucous coats. The arrows C show the direction in which fixation takes place, the adhesions beginning at the reflection of the mesentery from the outer wall of the bowel. These adhesions may exert such a strain on the bowel as to reduce its calibre very materially, especially at certain points. This is much exaggerated by any distension of the bowel below a constriction, and may be so great that the intestine becomes occluded at this point. Such an obstruction exists occasionally in the large bowel on the

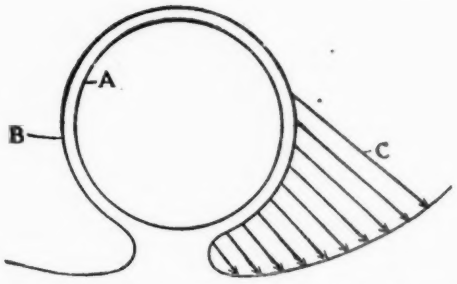


Fig. 2. Transverse section seen from above. A. Muscular and mucous coats; B. Peritoneum; C. Direction of adhesions.

right side at the level of the iliac crest, where the abrupt change from a firm, bony relationship to that of a flaccid muscular wall renders the production of a kink more easy.

Fig. 3 represents a transverse section through the sigmoid and meso-sigmoid and the peritoneum covering the iliac fossa external to the meso-sigmoid. As in the last diagram, the line B indicates peritoneum, and the line A the bowel. Owing to the possession of a mesentery of some considerable length, the bowel is at a much greater distance from the abdominal wall than the caecum and ascending colon, which are immediately adjacent to it, and the mode of fixation differs somewhat in detail from the last described. The outer surface of the mesentery is gradually brought down to its base by the formation of adhesions, till the wall of the sigmoid itself becomes secured to the floor of the fossa. The mode and direction of the formation of these adhesions are represented by arrows C.

Associated with the progressive fixation of the sigmoid loop, there is a diminution of its lumen and of its length, so that the bowel, which normally forms a loop of considerable size, moving freely at the end of a long mesentery, finally becomes telescoped as a short, straight, constricted tube, attached by a considerable area of its circumference to the abdominal wall quite devoid of any mesentery. In proportion as the bowel becomes fixed and unable to perform its functions with freedom and facility, so its muscular coat wastes. The state of fixation and shortening of the sigmoid flexure, wasting of its muscular coats and the general and occasionally also a very considerable local reduction of its lumen, the obliteration of much of its peritoneal covering, are of great importance surgically, since they interfere very materially with the passage of material through the sigmoid and render any operation on this portion of the bowel abnormally difficult.

The left ovary and Fallopian tube are often involved in these adhesions, and the adherent ovary very often undergoes a cystic degeneration. As it increases in size it forms a space in the acquired mesentery in which it moves, its outer wall and the lining of the space enclosing it re-acquiring a peritoneal covering.

By its growth it destroys those adhesions which attached the meso-sigmoid, leaving a mesentery connecting the sigmoid itself to the abdominal wall. As the tumour increases in size, it must destroy the residual mesentery and become free, except for its attachment to the broad ligament. How far the fixation of the left ovary in adhesions is responsible for the cystic degeneration it undergoes you must judge, but I have seen and demonstrated on

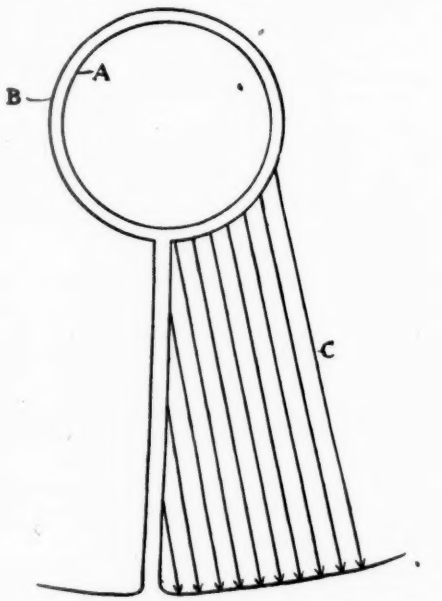


Fig. 3. A. Muscular and mucous coats; B. Peritoneum; C. Direction of adhesions.

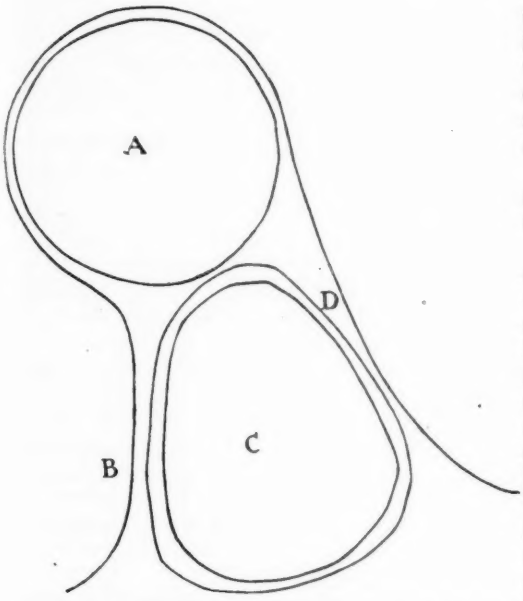


Fig. 4. A represents the sigmoid in transverse section; B the original mesentery; C the cystic ovary lying free in a cavity; and D the remains of the acquired adhesions.

numerous occasions the association of the conditions here described.

As in the case of the caecum, owing to the bowel having escaped beyond the control of adhesions, the sigmoid, instead of becoming shortened, atrophied, constricted, straightened, and fixed, becomes very much more elongated, dilated, and mobile than normal, its muscular coat being correspondingly hypertrophied. A certain amount of obstruction to the passage of faeces from the sigmoid into the rectum is present, since, when sufficiently elongated, the loop twists on itself. It is in these cases that complete intestinal obstruction may occur, owing to the twist or rotation of the overloaded and elongated loop becoming sufficient to prevent the passage of any material from the sigmoid loop into the bowel beyond. It will thus be seen that the so-called volvulus of the sigmoid (occurring spontaneously and not as an after-effect of an abdominal operation) is a phase of a condition of partial obstruction of long standing, the loop being habitually over-distended with intestinal contents, and the passage of faeces from it being chronically interfered with. I do not think that acute volvulus of a perfectly normal sigmoid can occur suddenly, spontaneously. The same remarks apply equally to volvulus of the caecum.

The rectum is usually elongated, dilated, and free from any abdominal adhesion. Its muscular coat is hypertrophied.

The stomach shows changes that vary in extent with the degree of descent of the transverse colon. It becomes dilated, its greater curvature reaching to an abnormally low level. Its upper margin is sometimes drawn up beneath the liver and ribs by a thickened and contracted lesser omentum, while occasionally the lesser omentum is stretched, thinned and elongated, so that the lesser curvature to the left of the pylorus occupies a position which is very much lower than usual. This retraction is most marked about the pylorus, which, with the commencement of the duodenum, is frequently attached to the under surface of the liver and gall-bladder by strong adhesions. It is obvious that the downward drag on the convexity, associated with the upward strain in the pylorus while the trunk is erect, must result in a progressive difficulty of evacuation of the stomach contents in the consequent further dilatation of that organ.

The posterior surface of the stomach is sometimes attached to the peritoneum covering the pancreas and adjacent structures.

The small intestines show changes which become more distinct as they approach the caecum. The lumen of the bowel is increased, while its several coats are abnormally thin and translucent. If a number of coils be collected in the palm of the hand, they remain flaccid and do not assume a circular form, but are jelly-like or diffluent in consistence. These characters all indicate considerable degeneration of the muscular and mucous coats.

Occasionally in advanced cases coils of small intestine are found to be attached to one another or to adjacent structures.

The kidneys are usually mobile. In many of the cases I have operated upon for chronic constipation, one or both kidneys have been previously fixed by operation, often without much benefit to the patient. The kidneys

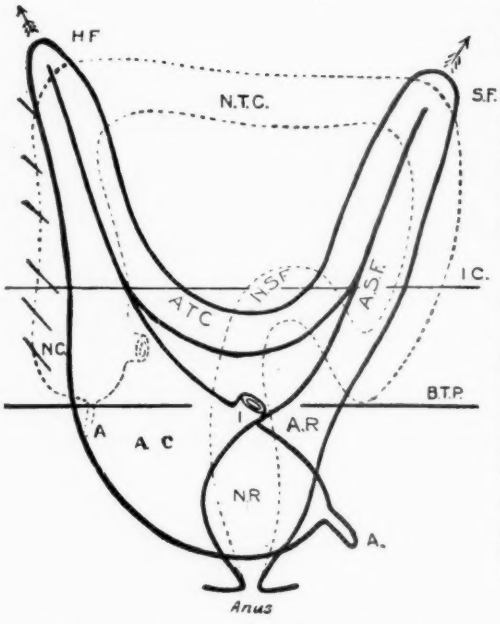


Fig. 5 represents diagrammatically many of the changes which the large bowel undergoes in consequence of the habitual interference with its functions by constipation. The normal condition is shown as a dotted line, while the firm outline illustrates the modifications which take place in consequence of habitual overloading. N. C., N. T. C., N. S. F., and N. R. indicate what may roughly be regarded as the normal caecum, transverse colon, sigmoid flexure and rectum, while A. C., A. T. C., A. S. F., and A. R. represent these parts in their altered state. B. T. P. and I. C. show the lines of the brim of the true pelvis and of the iliac crests. The appendix is left free from adhesions or deformity, so as not to render the diagram too complicated.

are rendered more or less mobile by two factors. One is the strain exerted upon them by the large bowel. As the drag exerted on the right kidney is usually much greater than that experienced by the left one, the mobility of the former organ is correspondingly greater.

The second factor in determining and facilitating the displacement of the kidneys is the absorption of fat, which is consequent on the auto-intoxication produced by intestinal stasis.

Progressive loss of fat and the increasing staining of the skin are perhaps the most marked objective features of this form of poisoning. They produce that appearance of premature age which is so characteristic of faulty intestinal drainage.

The rapid loss of fat and an associated degeneration of the muscles and other tissues are responsible for many other troubles. All the viscera of the abdomen are very much affected, losing their support, and resulting in a condition commonly described as enteroplosis. Obstetric disabilities are the direct result of the absorption of poisonous products from the intestinal tract. The loss of fat appears sometimes very abruptly, as if the tissues of the individual had continued for a long time to offer a sufficient resistance to the influence of the poisons and then suddenly gave up the struggle. In other cases the patient becomes gradually thinner. The skin is thin, sticky, inelastic, abnormally dark, and dirty-looking. The staining of the skin is partly general and partly local. It is at first a transitory feature and disappears with free purgation. Popularly the person is described as being "off colour" or "bilious."

The skin of the hands and feet is dark, cold and clammy, while that covering the back part of the upper arm is thick, coarse and blotchy in color.

Later the skin becomes permanently dirtier than normal, the tinge varying, however, with the degree of toxicity of the sufferer. Besides this general pigmentation, we find areas of exaggerated pigmentation corresponding usually to such surfaces as are exposed to friction, or are normally dark. For instance, the skin of the labia and anus, the inner aspects of the upper part of the thigh, the margins of the folds of the axillae, and the bend of the elbow. The skin covering the spines of the lumbar vertebrae, especially in women, the neck, the lower eyelid, and the area below it, the inner portion of the eyelids, and the prominent parts of the cheek and temple show this pigmentation in a very marked manner. The conjunctiva is also stained, first temporarily and then permanently, the colour varying in depth.

I would point out in passing, that the liver, probably from its bulk, has been blamed for much of the trouble produced by the faulty mechanics of the intestines, and drugs which hasten on their contents or possess antiseptic

qualities are given with the view of affecting that organ. I need only refer to mercury as an excellent example of this class. In operation for gallstones I have always found most definite evidence of defective intestinal drainage, suggesting that the infection of the ducts of the liver results from a damming back of organisms into a portion of the canal they do not normally inhabit.

This explains the benefit that so frequently follows in cases of inflammation of the gall-bladder, with or without gallstones, upon the stimulation of the passage of material through the intestines or its sterilization by drugs, such as olive oil, calomel, etc.

It is also possible that the development of adhesions between the pylorus and gall-bladder may so affect the functioning of the latter as to tend to the formation of gallstones.

The presence of the distended and inflamed caecum in the true pelvis interferes with the efficient performance of the functions of the ovaries and Fallopian tubes, and may produce adhesions of the tubes or ovaries. The breasts undergo a cystic change at an early period. In this way the intestinal stasis and the conditions associated with it are responsible for much of the sterility of women.

The presence of toxic materials in the circulation diminishes the resisting power of the tissues to the entry of organisms, and makes the sufferer a more ready victim to tubercle, rheumatoid arthritis, gout, gastric ulcer, and other diseases. In some cases the tissues are unable to resist the entry of the organisms thriving in the decomposing food about the teeth. The gum about the lower incisor teeth is the first to show this change. Infection of the gums, with destruction of the teeth and inflammation of the lymphatic tissues in and about the mouth and pharynx, serves to increase the gastro-intestinal disturbance by pouring deleterious matter into the stomach and by fouling the air entering the lungs. In advanced stages the skin has a peculiarly objectionable smell, most marked in the flexures. The flesh, when incised, has also a disagreeable earthy odour. This is particularly noticeable in operations on the abdomen where a large area of peritoneum is exposed.

THE MECHANICAL CAUSATION OF THE CHANGES DESCRIBED

The causation of the several pathological changes has been, to some extent, indicated in their description. It may be considered under two distinct headings.

First, there are the changes which ensue in consequence of the viscera being exposed to mechanical conditions other than normal in the process of evolution.

Secondly, we have to deal with the several degenerative processes which ensue on account of the absorption of toxic materials from the gastro-intestinal tract.

I have made it clear that the mechanical factor determining the several changes is an overloading of the large bowel, and especially of that portion which serves as the cesspool of the gastro-intestinal tract, namely, the caecum and ascending colon.

The excessive distension of this portion of the tract results very largely from the habitual assumption of the erect or sedentary posture during the greater part of the twenty-four hours in civilised communities. The mechanical interference resulting from this is exaggerated in the woman by the constriction of the waist, and by the imperfect development of the abdominal muscles, both due in great part to the use of stays. The abdomen of the woman is placed at a considerable mechanical disadvantage, as compared to that of the man, by its greater relative length, the thorax being encroached upon very considerably. To compensate for this, the upper part of the femoral thorax in the female is relatively larger than it is in man. This is requisite to meet the impairments of diaphragmatic and inferior thoracic respiration produced by the foetus in the later months of pregnancy.[1] In the act of defaecation in the sedentary posture, the viscera generally in the caecum and transverse colon in particular are driven downwards and forwards into the true pelvis. In this position there is a tendency to drag and displace downwards both kidneys, and especially the right. In this attitude the pressure afforded by the forcible apposition of the thigh and abdomen

[1] Pathology of changes produced by pressure in the trunk and shoulder girdle. Guy's Hospital Reports, 1886.
The mechanical factors which determine the variation in the form of the pelvis in the two sexes. Obstetrical Society's transactions.

which is exerted when the squatting position of uncivilized life is assumed is lost. In the squatting posture the forcible apposition of the thigh and abdomen empties the caecum and transverse colon, retains the kidneys and other viscera in position, and forcing up the segmoid which should exist as a freely mobile loop, the rectum is pulled upwards and straightened and the passage of faeces through it very materially facilitated. Besides the intra-abdominal contents are exposed to a far greater pressure than can be brought to bear on them in the sitting position. The apposition of the thigh also removes all risk of hernial protrusion through the inguinal and femoral rings during straining. In savage life the postures are infinitely more varied, the recumbent and squatting attitudes being assumed for long periods during the daytime. In many countries the squatting posture is employed during micturition as well as during defaecation.

The overloading affects, in the first instance, the caecum and ascending colon, distending this sac, stretching and possibly to some extent inflaming its coats. During the period in which the individual occupies the erect or sedentary posture material accumulates in the caecum and ascending colon. It produces a gradually progressive distension, so that the caecal extremity descends downwards and inwards into the true pelvis and exerts strain upon the attachment by peritoneum of the bowel to the iliac fossa and loin externally, and especially upon the hepatic flexure. The strain on the flexure in this position after a time renders it difficult or impossible for faecal matter to pass the flexure. The interference with the lumen of the bowel at the flexure is increased if there is also a quantity of faeces accumulated in the transverse colon. After a time material discharged from the small intestine into the caecum and ascending colon continues to occupy and distend these portions of the large bowel during the whole day, and it is only when the supine position is assumed at night that the mechanical conditions render the flexure pervious, and gravity assists in their evacuation. The same applies in a lesser degree to the splenic flexure.

I have already shown elsewhere, that whenever such a condition arises in the body as can be benefited by the formation of a new mechanism, or the modification of an already existing one, such an arrangement develops. Perhaps the best instance of this that I can point to of the development of an entirely new mechanism is the buttress which develops on the lateral mass of the atlas of the shoemaker, and which forms a new joint with the jugular process of the occipital bone. ("The Anatomy and Physiology of the Shoemaker," Journal of Anatomy and Physiology, July, 1888.) In the case of the vertical and transverse portions of the large bowel the weight is distributed along the adhesions and bands which extend from the outer surface of the transverse colon to the vertical portions, and from them to the adjacent abdominal wall, fixing them and pinning the flexures abnormally high up in the loin. Inflammation may ultimately play a part in the formation of these adhesions, but it is not solely responsible for their presence, as, if it were, the inflamed bowel would form adhesions to all structures in contact with it, and not merely where strain can be most effectually met by the formation of resisting bands.

The transverse colon drags upon the stomach, tending to pull it downwards. This tendency is opposed by the thickening and shortening of the right margin of the lesser omentum, supplemented by the formation of bands or adhesions, which extend from the undersurface of the liver and gall-bladder to the upper border and anterior surface of the pylorus and adjacent portion of the duodenum, and which hold up and fix these structures at an abnormally high level.

In consequence of the drag exerted by the bowel on the convexity of the stomach and the upward displacement and fixation of the pylorus, this organ experiences a progressive difficulty in emptying its contents while the erect position is assumed and dilatation ensues. The coats of the stomach become more or less inflamed, the posterior wall of the stomach forms adhesions to the structures adjacent to it. Ulceration of its mucous coat is not uncommon. A knowledge of these facts helps to explain the benefit experienced by cases of dilated stomach who are treated by being retained in such a position that this viscus is freed from the strain exerted upon it by the

large bowel. It seems to me that there is much obscurity as to the causation of dilatation of the stomach as well as of many digestive changes, for the reason that the more simple mechanical aspect of the condition is neglected, while the more elusive chemical results of such processes are pursued instead.

I have already called your attention to the liability to ulceration of the stomach of patients suffering from intestinal stasis.

In cases which I have operated on for gastric ulcer, either because of pain, haemorrhage or perforation, I have found the stomach dilated and often hypertrophied together with all the changes which I have described as consequences of chronic constipation. As a further proof that the ulceration of the stomach is secondary to interference with the passage of material from it, I would remind you of the success which almost invariably follows upon the removal of the obstacle by the effective drainage afforded by gastro-enterostomy.

It is not impossible that the toxic condition present renders the mucous membrane less resistant than normal to the irritating action of the contents of the stomach delayed for too long a period in it.

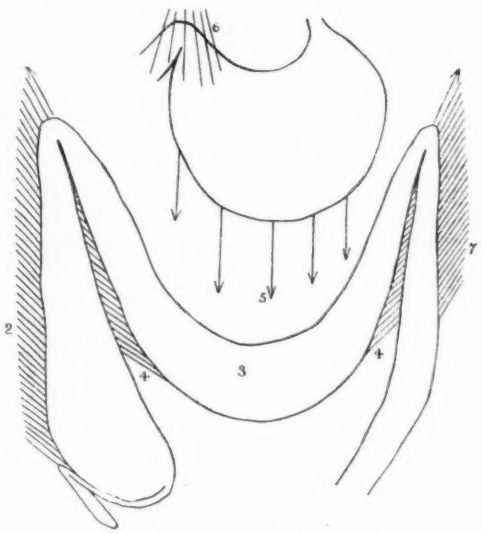


Fig. 6 represents: (1) The dilated caecum and ascending colon, with the appendix involved and distorted by the lower limit of the adhesions; (2) which fix this section of the large bowel; (3) the elongated and dilated transverse colon with the acquired mesenteries; (4) between it and the ascending and descending colon. These serve to transmit to the vertical portions of the large bowel much of the weight of the transverse colon. The remainder of the strain exerted by the transverse colon is exerted along the great omentum; (5) to the greater curvature of the stomach. This strain is also met partly by the acquired adhesions; (6) which overlap and hitch up the pylorus, and partly by the adhesions 2 and 7, which fix the ascending and descending colon respectively.

THE TOXIC CAUSATION OF CHANGES DESCRIBED

The absorption of toxic material produces a degenerative change in all the structures of the body. The heart and vessels show marked evidences of decay. The hands and feet are cold, clammy, patchy, and bluish. The voluntary muscles become pale, wasted, and abnormally friable, and fat disappears from the tissues. I have already described the changes which are produced by the toxins in the skin.

The clinical symptoms vary also, as they are brought about by the over-loading of the intestines and the consequences which ensue on it, or by the absorption of toxic material from some portion of the gastro-intestinal tract.

The material harm done directly or indirectly by imperfect intestinal drainage is infinitely greater and more far-reaching than that ascribed to alcohol, while the misery inflicted on the individual, as well as on those brought into constant association, is often very intense, and though the depression of mind and body produced by it sometimes drives the sufferer to find refuge from the one or a stimulus to the other in alcohol, it is very unusual for those who are addicted to alcohol to suffer from intestinal stasis.

While in the large proportion of cases of sluggishly acting gastro-intestinal tracts constipation exists in varying degrees of severity, a certain number of patients obtain a daily evacuation, a surplus being discharged daily from an over-loaded cesspool. In an even smaller proportion of cases diarrhoea may exist, the patient having several fluid and often offensive evacuations, one following immediately on a meal, or there may be alternating periods of constipation and diarrhoea. The diarrhoea may be of a very irritating character, and much mucus, or even mucous

casts, or blood may be present in the motion. Indeed, some infection of the colon is not a rare complication.

We will now consider the clinical symptoms which are associated with the altered mechanical conditions of the intestines.

In the first instance, I think we may assume that what is commonly called indigestion is the earliest factor in the determination of the delayed functioning of the gastro-intestinal tract consequent on the altered condition of the intestines, which results from improper feeding. This, by diminishing the general energy and the respiratory capacity, assists in reducing progressively the ability of the several portions of the body to perform their normal functions, and impairs still further the manner in which the drainage apparatus does its work. Indeed, indigestion in one form or another may be regarded as a usual concomitant of delayed and obstructed drainage. The frequent distension of the appendix, caecum, ascending colon, transverse colon, and subsequently of the small intestine and stomach, produces feelings of illness, physical and mental inactivity, nausea, vomiting, flatulence, or pain, which are in part due to the more local distension determining a reflex upset of the whole tract, and partly to the toxic influence exerted by the ptomaines absorbed by the mucous membrane.

The patient experiences considerable discomfort, tenderness, or pain over the caecum and ascending colon. This may extend downwards and inwards over the middle line into the true pelvis. Associated with this there may be pain and tenderness below the last rib on the right side, and often along the distribution of the ilio-inguinal and ilio-hypogastric nerves. The pain in the loin, and that reflected along the nerves, increases as the day goes on. They occasionally simulate very closely the pain of stone in the kidney, and have frequently led surgeons to explore the right kidney. Finding nothing in the condition of the kidney to account for the pain, the surgeon has been disappointed, but more often than not the patient has been relieved for a time. The surgeon has easily explained this post-operative amelioration of symptoms on the ground that an operation on the abdomen, though apparently unsuccessful, may do good by impressing the patient morally. In this case, as in most others, there is no necessity to draw on one's imagination, since the procedure necessary to explore the kidney thoroughly liberates the attachment of adhesions and bands pulling on the hepatic flexure, and frees the bowel for a longer or shorter period from the obstruction, the real cause of the symptoms. The position of recumbency is also partly responsible for the improvement, since in that posture drainage is carried on more efficiently.

The pain immediately below the last rib is due partly to the drag exerted upon this area by the adhesions when the patient is in the erect posture, and when in the supine posture from the backward thrust of the upper extremity of the distended bowel. The same traction exerted upon the last dorsal, ilio-inguinal and ilio-hypogastric nerves accounts for the reflex pain described, which simulates renal irritation.

A little consideration of the mechanics of the big bowel shows that while the caecum and ascending colon have great difficulty in passing on their contents in the erect posture, their evacuation is very much facilitated by the assumption of the supine position, and this may be increased still further if the pelvis is raised by elevating the foot of the bed. The increased facility of evacuation of the faeces from the cesspool in the supine posture probably accounts for the morning evacuation of civilised life.

When the lower part of the distended caecum occupies the true pelvis, a dull pain is experienced over the sacrum about the right sacro-iliac joint. This pain is much exaggerated during defaecation, when the patient has a sensation of an obstacle in the bowel which cannot be overcome. Straining drives the large, engorged and inflamed caecum further downwards and perhaps into the pouch of Douglas and makes matters worse. The patient may be unable to lie on the left side, owing to the drag exerted by the loaded caecum.

The transverse colon sometimes produces considerable discomfort or pain. Its position, like that of the remainder of the large bowel, can be defined by the hands as it descends to

the brim of the true pelvis. When the splenic flexure is obstructed, the patient complains of a griping pain along the course of the ascending portion of the distended and elongated transverse colon, and of a dull aching pain in the left loin about the last two or three ribs. This last pain is produced in the erect trunk by the drag and in the supine posture by the thrust of the loaded bowel.

The fixed and shortened sigmoid is often very tender on pressure, and can be readily felt in its abnormal situation. Severe pain may be complained of during the passage of faeces through it. This pain may be so great as in some cases to leave the patient quite collapsed. In a considerable number of cases, the pain in the sigmoid is the reason the patient sought for relief. The abdomen is fuller than it ought to be, and a little careful manipulation shows the presence of a quantity of fluid in the small intestine, and particularly in the ileum, where material accumulates because of the difficulty of its entry into the caecum.

The diminution in respiratory capacity, which is brought about in consequence of indigestion in young people, is a matter of vital importance and is a very material factor in lowering the activity of all the vital processes in the body. In the first instance, deficient oxygenation results from serious alterations in the abdominal mechanics. Later a vicious circle is formed, the defective aeration impairing the digestive processes.

Very soon after birth, in the state of civilization familiar to us in this country, the imperfect nature of the food supplied, which is not often material in origin, produces disturbances of the gastro-intestinal tract and consequent imperfect nutrition. Now, in infancy, indigestion is a very much more serious condition than it is in adult life; indeed, one may safely generalise by saying that the harm done by disturbance of the gastro-intestinal tract varies inversely with the age of the child. In young life, the supply of nutritive material derived from the intestines has not only to meet ordinary wear and tear, but an excess has to be obtained from which to form new tissues, and the growth of the child depends largely on the amount of this balance. As the process of digestion is vastly more active in infancy, the facility with which it is interfered with is correspondingly great, and the consequence of such upset is far-reaching and disastrous.

The result of indigestion in the infant is to produce an inflammation and distension of the intestines and irritation and enlargement of the lymphatic glands draining the tract through which material passes, probably in an abnormal state, setting up troubles and disturbances in transit. Associated with these conditions and in consequence of them, a varying quantity of serous fluid is thrown out by the irritated peritoneum. The general depreciation of vitality and the formation by the inflamed glands and the peritoneal effusion of suitable culture media, render the abdomen of young infants a very common seat of tubercle.

An examination of the left ovary may show that it is fixed and, in many cases, that it has undergone definite cystic change. It is often very sensitive, probably because its fixation prevents its eluding the pressure of the fingers.

The mental depression and depreciation associated with this form of poisoning are remarkable, the patients being unable to concentrate their attention on anything; they are sometimes so drowsy as to appear to be under the influence of a narcotic. The toxic symptoms increase during the day and may necessitate recumbency about or before noonday. This position having relieved the obstructed drainage of the caecum, the patient is able to make a fresh start. These patients are liable to attacks of faintness, giddiness, neuralgia or headache, due to the presence of a large quantity of toxic materials in the circulation, or to pressure on the heart by distended stomach or bowel, or to both. Loss of control over the temper is also a very marked feature.

The progressive loss of fat and the increasing staining of the skin are perhaps the most marked and serious features of this form of poisoning. These two conditions especially combine to produce that appearance of premature age so characteristic of faulty drainage. Their onset affords definite evidence that the body has become unable to resist the influence exerted by the poison upon it, and unless this deleterious influence be met effectually, degen-

erative processes proceed at a rapidly increasing rate.

I have already demonstrated the mechanical relationship of so-called "appendicitis" to overloading of the cesspool or caecum, and as its symptoms are more or less generally known, I will not allude further to them here. I say more or less generally known, as there is a remarkable tendency to ascribe to the appendix any tenderness present in or about a line which extends from the anterior superior spine of the right ilium to the umbilicus. Those making this mistake have, however, the satisfaction of knowing that if the appendix is not the cause of the trouble its excision involves practically no risk. It can be removed through a very small hole, the comparative minuteness of which, and the very brief convalescence which ensues, gratify the operator and the patient, and suggest great skill. The operation frees the patient from a possible danger, and the surgeon explains the freedom from inflammation of the appendix on the supposition that between attacks it may be quite normal. While the patient remains on the back during convalescence, the absence of symptoms also suggests success, this opinion being only modified by the subsequent course of events.

The presence of the distended and inflamed caecum and appendix in the true pelvis probably interferes with the efficient performance of the functions of the ovaries and Fallopian tubes, and in some cases matting of the tubes or ovaries results in consequence. The presence of toxic material in large quantity in the blood causes a loss of pelvic fat and a want of tone in the muscle of the uterus, etc., and interferes with the perfect functioning of the organ and its appendages.

When the stomach has become dilated, the symptoms due to it become an additional feature of the case. I have only referred indirectly to the attacks of acute obstruction of varying degrees of completeness and severity which may arise from interference with the passage of faecal material from the caecum into the ascending colon, from the ascending colon into the transverse colon, and from the transverse colon into the descending colon.

A knowledge of the mechanics of the changes which ensue in the large intestine will readily enable the surgeon to diagnose these conditions and to differentiate them from trouble in the stomach, kidney, gall-bladder, appendix, uterus, or rectum, to all of which structures I have frequently known them attributed.

In the treatment of such degrees of overloading of the large bowel as cannot be treated efficiently by measures short of operation, I have obtained considerable success by dividing constricting bands and adhesions, and by subsequent careful attention to the proper functioning of the bowel. In a considerable proportion of cases, and more particularly in women, such means are insufficient, as at the best they only afford temporary relief, since the obstruction recurs sooner or later.

In my earliest cases, after the appendix had been removed and the caecum and flexures freed from adhesions, on one or more occasions without any other than transitory benefit, I looked about for some means of relieving the patients of the caecal pain from which they suffered and for the relief of which they were ready to submit to any operation. Pain was the chief symptom of which they complained. I mention this as it has been suggested that I was led to remove the caecum by Metchnikoff's excellent work. Unfortunately I was unaware of it at the time. I did not appreciate the importance of the toxic effects till I observed their almost sudden disappearance after division of the ilium. In the first case I merely made a lateral anastomosis between the ileum and sigmoid, but the early return of caecal pain obliged me to divide the ileum. In several of these cases after an interval of months the patients were occasionally annoyed by the presence of hard dry masses of faecal matter in the caecum. These produced no auto-intoxication, but the discomfort arising from the pressure was sufficient to make me remove the large bowel as far as the splenic flexure. They are not necessarily the result of regurgitation, but are probably secreted by the large bowel. A still more extended experience showed me that if any portion of the large bowel is left above the junction with the ileum, it tends to dilate sooner or later. This dilatation may interfere with the satisfactory evacuation of faeces, and

discomfort or pain may ensue because of its distension by faecal matter or gas. Therefore to overcome the constipation as well as the septic absorption, the large bowel should be removed as far as its junction with the ileum which is affected in the upper part of the rectum or in the adjacent sigmoid.

Therefore, when I recognise that the mechanics of the intestines have been altered to a degree that cannot be rectified satisfactorily by the division of bands, etc., I divide the ileum at a distance of about five or six inches from the caecum. This can be done rapidly and securely by applying a strong compression forceps on the ileum, so as to reduce the bulk of the coats to the minimum possible.

As the forceps is removed, the compressed band of bowel is ligatured by means of a sufficiently stout ligature. The ileum is divided by the cautery immediately beyond the ligature. The stump is then buried in the proximal bowel by means of a purse-string suture which encircles the bowel about three quarters of an inch above its ligatured extremity, rendering the closure absolutely secure, and perforates its peritoneal and muscular coats. (Figs. 7 and 8.)

The acquired adhesions and peritoneum which bind the caecum and ascending colon to the abdominal wall external to them are divided and the bowel is raised till the vessels which supply it are exposed. These are grasped in compression forceps and firmly ligatured. The vessels supplying the transverse colon are similarly treated, and finally the descending colon and sigmoid are removed, the rectum or the lower part of the sigmoid being occluded in the same manner as the ileum.

I had usually been satisfied to divide the transverse colon at the splenic flexure, closing the distal portion in the manner already described, but for the reasons I have given I now remove the descending colon and the sigmoid, closing the large bowel at or just above its junction with the rectum.

The termination of the ileum and the rectum adjacent, to it are brought into convenient apposition, and a perfectly secure and reliable lateral anastomosis is made by means of a double row of continuous sutures, the inner

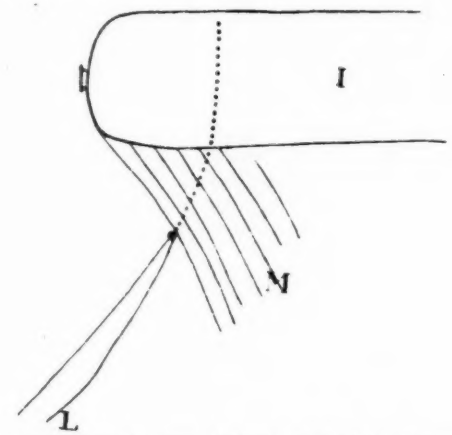


Fig. 7 shows the ileum, ligatured and divided; L represents the suture which is passed beneath the peritoneum of the mesentery (M) and of the bowel (I,) which it encircles transversely.

row of which perforates all the coats, while the outer does not enter the lumen of the bowel.

If the surgeon prefers it, the ileum and rectum may be united end to end. This is the better way, since any tendency to pouching which exists in the case of lateral anastomosis is avoided. The objection to it is that it is not so absolutely safe because of the difference in the circumference of the two pieces of bowel, the frequent great tenuity of the wall of the ileum, and the difficulty occasionally met with in dealing with the mesenteric attachment.

Finally, a fine gut ligature is passed through the free incised margin of the mesentery of

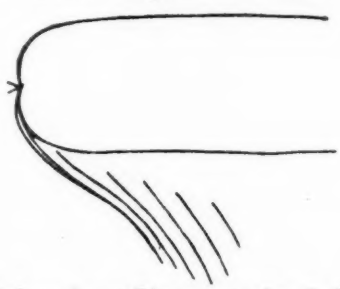


Fig. 8 shows the condition present when the ligatured stump of bowel has been invaginated by means of forceps within the limits of the encircling suture, which has then been drawn tight.

the ileum, and then beneath the peritoneum forming the outer wall of the meso-rectum. This, when made tight, brings the rectum to the middle line of the pelvis and fixes it securely in that situation immediately beneath the position occupied normally by the divided end of the ileum. The ligature also closes the interval between these two mesenteries through which a loop of bowel might otherwise pass and give trouble.

If, however, the condition of the patient is very unsatisfactory, or if for any reason the removal of the large bowel is unnecessary, very difficult or dangerous, I am satisfied to divide the ileum and connect it with the sigmoid or rectum. If necessary, the large bowel can be removed later when circumstances have altered.

The stomach is exposed and is usually found to be dilated to a varying extent. In this condition the pylorus is hung up by adhesions to the liver and gall bladder. These are freely divided. I have employed gold leaf to obviate the reformation of adhesions with apparent advantage. Those adhesions tend to reform. When the weight of the transverse colon has been removed, during the period of recumbency following on the operation the dilatation of the stomach usually disappears more or less completely. On several occasions after a varying interval from the operation of resection of the large bowel the dilatation of the stomach has become a feature of sufficient importance to require its more effective drainage by a gastro-enterostomy. This operation has afforded complete relief of the gastric symptoms. Curiously enough, I have seen cases of chronic intestinal stasis in which a gastro-enterostomy alone has been done with very distinct disadvantage to the patient. To attempt to relieve symptoms by performing a gastro-enterostomy in the first instance, is of little avail.

The kidneys often become so mobile as to necessitate their fixation. The operation which I have performed with uninterrupted success for this purpose is one I devised and described in the Transactions of the Clinical Society, 1892, in "A case of floating kidney treated by a mode of nephrorrhaphy."

Should the blockage of the bowel be of sufficient severity and duration to have resulted in adhesions of the small intestines, it is well to examine it along its length and divide such adhesions and bands as effectively as possible.

In certain circumstances it may be necessary to consider the advisability of establishing lateral anastomosis between anchored loops of the small bowel liable to obstruction, or, if convenient, to divide the ileum above the obstruction in it.

In a severe case in which the small intestines were pinned down and obstructed in many places I freed the adhesions and removed the large bowel. At a subsequent operation for freeing the pylorus, I found the small intestine had recovered its normal condition and that all evidence of previous adhesions had disappeared. This suggests that adhesions of the small intestines may disappear after the removal of the large bowel.

In volvulus of the caecum producing acute obstruction, if the condition of the patient permits of an operation somewhat longer than that of merely replacing or draining the distended bowel, the ileum is divided and connected with the rectum. If the conditions are favourable, the large bowel may be excised, but if not, it may be done later, should it give trouble.

In volvulus of the sigmoid the treatment varies with the conditions present. In cases of moderate severity a good result can be secured by imitating the process which takes place usually in chronic constipation, namely, the shortening of the meso-sigmoid and the fixation of the sigmoid. This can be effected by a number of continuous sutures attaching the meso-sigmoid, and then the sigmoid to the peritoneum lining the adjacent abdominal wall. When the sigmoid is enormously dilated and acutely inflamed, two modes of treatment suggest themselves. On two occasions, after draining and washing out the bowel, I have excised the entire loop and obtained a perfect junction. I employed a Murphy's button for this purpose, as, owing to the very considerable difference in the calibre of the two sections of the bowel, their fixation to the iliac fossa, and the condition of the patient, it was practically impossible to connect them in the usual way by sutures. As cases may arise at the time or

subsequently as seems wise in circumstances in which sufficient assistance is not available, a more simple procedure is to drain and to irrigate the loop, and to establish a large lateral anastomosis of the loop itself near its base, dividing and closing each limb of the loop beyond the junction. I have also cut through the limbs of the loop just beyond the margin of the abdominal wound and have established an end-to-end anastomosis.

Except in patients who are supremely toxic and feeble, the removal of the large bowel is accompanied with little risk. If, however, the obstruction be acute and the intestines and abdomen be distended, the risks are rather those of the condition calling for interference than of the operation itself. Except in very advanced cases, in which the small intestines have become adherent to one another, and consequently liable to obstruction, this operation affords the patient more or less complete freedom from all the symptoms which existed previously, the amount of relief varying inversely with the changes which have arisen in consequence.

In my earlier cases vomiting was a very troublesome feature. It frequently continued for several days after the operation. This can be readily obviated by the introduction of considerable quantities of normal saline solution subcutaneously during the three days following the operation. I am encouraged by recent experience to believe that the formation of adhesions which occasionally follows the removal of the large bowel is obviated by this treatment.

I would urge operating at a sufficiently early date. If you delay interference till the small intestines have been habitually distended with faecal contents, and their walls have become thinned and their muscle wasted and inefficient, till the stomach has also become affected, and the gastro-intestinal tract has got into the habit of performing its functions in a dilatory and unsatisfactory manner, you will obtain only a partial amount of benefit from the operation. It would seem that once the involuntary muscle-fibre of the intestine has become overstrained by the pressure exerted upon it over a long period of time by the intestinal contents, its recovery is very slow and imperfect.

BONE SARCOMA: DIAGNOSIS, PROGNOSIS, AND TREATMENT[1]

By WILLIAM B. COLEY, M. D., New York
Attending Surgeon to the General Memorial Hospital; Associate Surgeon to the Hospital for Ruptured and Crippled

SARCOMA of bones practically includes all cases of malignant disease of the bones, as there is but a very small number of cases of carcinoma of the bone, and these are always secondary to a primary tumor in the soft parts. I have seen 4 cases of carcinoma of the femur, which were secondary to carcinoma of the breast; and 3 cases of carcinoma of the spine, secondary to carcinoma of the breast.

Sarcoma of the bones forms a very large part of the total number of cases of sarcoma. My own series of cases, observed since 1890, shows 234 cases of sarcoma originating in the bone out of a total of 630 cases of sarcoma in general, i. e., 37 per cent.

There are certain bones that show a peculiar predisposition, if one might so call it, to sarcoma, and yet, if one analyzes the cases, it will be seen that the bones most frequently attacked by sarcoma are the bones that are most exposed to external injury. The most frequent sites in my own series are the following:

Femur, with	39
Superior maxilla	32
Orbit	22
Humerus	15
Tibia	13
Ilium	14
Clavicle	10
Scapula	9
Skull	6
Spine	6

[1] Read before the American Orthopedic Association, Washington, D. C., May 8, 1907.

A glance at this list will show that the bones most frequently affected are those which are most liable to external injury.

While the limits of this paper do not permit me to dwell upon the etiology of sarcoma of the bones, I may be allowed to say that of all theories that have been offered to explain the cause of cancer, that of the microparasitic origin of the disease is the one most nearly in accord with known clinical facts. In no other way can one explain the development of periosteal sarcoma of the femur or humerus, immediately following an injury with rapid generalization through the blood vessels, causing death within a few months. The influence of trauma as a direct causative factor in malignant disease, and particularly in sarcoma of the bones, can no longer be doubted. Our histories to-day, taken with much more detail and far greater care than a generation ago, all show a strikingly large proportion of cases (more than one third) with antecedent local injury. We have reason to believe that the infectious cause of sarcoma, whatever it be, may remain latent for a long time, or perhaps indefinitely, in the system without harm, until the injury produces such a lowering in the local vitality of the parts and of their resisting power, that the slumbering process becomes active and the neoplasm begins to develop.

DIAGNOSIS OF SARCOMA OF THE LONG BONES

The most important step towards making a correct diagnosis is to obtain a careful clinical history of the case, the following points being of special importance:

1. The age of the patient.
2. Presence or absence of a history of local injury.
3. Hereditary influence, bearing in mind the fact that sarcoma not infrequently occurs in persons whose relatives died of carcinoma.
4. General health of the patient may aid in differentiating sarcoma from tubercular disease; patients suffering from sarcoma, especially in the early stages, being usually persons in the most robust health.
5. Previous history of syphilis.
6. Location of the swelling as regards proximity to a joint.
7. Presence or absence of pain.
8. Duration of the growth.
9. Periosteal or central origin of the tumor.
10. Consistence of the tumors (presence or absence of fluctuation).
11. X-ray examination.
12. Examination of the blood.
13. Microscopical examination of a section removed either with a tumor punch or by exploratory operation.

In sarcoma of the long bones a history of trauma is even more frequent than in sarcoma of the soft parts. Gross found it in 70 cases in a total of 144 cases; Mayer found it in 31 per cent of cases; Reinhardt in 16 per cent of cases; Nasse in 15 per cent of cases; Kocher in 20 out of 65; Ziegler in 67 out of 171. My own cases show accidental injury in 31 cases out of 66 in which the presence or absence of trauma was noted, or 47 per cent. In 3 cases the sarcoma developed at the site of a fracture.

The condition that most closely resembles sarcoma of the bone is tuberculosis of the bone; its similarity is often so great that the most expert diagnosticians have failed to differentiate the two conditions. In some cases it may be quite impossible to make a diagnosis without the aid of a microscopical examination of a specimen removed, but inasmuch as there are certain risks connected with these exploratory incisions, it is most important to be able to make a diagnosis, if possible, without such aid. In the great majority of cases of sarcoma of the long bones, the following clinical picture will be found to be sufficiently accurate to enable one to render a correct diagnosis: The patient will almost always be between 10 and 50 years of age, the majority between 20 and 40; general health will be perfect; there will be no family history of tuberculosis and no evidence of previous tubercular lesions. There will be a history of local injury of some sort in one third to one half of the cases — a blow, a fall, a fracture, a severe sprain — at some longer or shorter interval, usually less than six months, prior to the first appearance of the tumor. The first symptom the patient will have noticed will be local pain or local swelling, in about equal proportion of the cases. Gross states that pain occurs as first symptom in 62 per cent of the cases, a tumor in 33 per cent. In many of my own cases pain has been absent as an early

sign, and not of great severity until the later stages of the disease. The cases in which pain has been an early symptom have usually been treated for rheumatism for a longer or shorter time. In upwards of two thirds of the cases of sarcoma of the long bones the tumor will be found located in one end of the bone, the lower end in the femur, the upper in the tibia and humerus, probably starting in the epiphysis, but very rarely invading the joint, except in the later stages of the disease. In a few cases, especially those of the femur and tibia, it begins in the middle of the bone, and here it is nearly always the periosteal type, forming a fusiform enlargement of the shaft in the early stages when the diagnosis is important and treatment of value. The duration of the tumor or rapidity of its growth is also an important diagnostic sign. In nearly all cases the rate of growth is much more rapid than in either tuberculous or syphilitic swellings. In tuberculosis the joint is early invaded; there is more limitation of motion in the joint and more atrophy of the muscles of the limb above. Seen in the later stages, when the whole joint is affected by the disease and the patient has become emaciated and exhausted, the similarity of sarcoma to tuberculosis is very great.

The consistence of the tumor in sarcoma varies greatly with the type of tumor. In growths of periosteal origin, in the early stages, the consistence may be very firm; later on, when the tumor has reached considerable size, especially in the round-celled variety, the consistence may be very soft and semi-fluctuating, the tumor itself being soft and mush-like in appearance. In other cases of periosteal sarcoma, while the consistence of the tumor in general may be quite firm, there may be areas of marked softening and, in some instances, fluctuation due to the liquefaction of bone or cartilage. The introduction of a sterile needle with the withdrawal of clear serum will enable us to differentiate the condition from tuberculous abscess. In still other cases, particularly the myelogenous sarcomas of the upper end of the tibia, the tumor may show areas of softening similar to those described and other areas which, on palpation, give the egg-shell crackling sensation which is fairly characteristic of the disease.

The temperature may offer some slight help in the diagnosis. A regular evening rise of temperature of 1° to 2° would be slightly in favor of tuberculosis, although it is not at all infrequent to find slight, irregular temperatures in sarcoma of the femur even in the early stages.

I have on several occasions observed a temperature of 99½° to 100° or 101° in sarcoma of the femur, and in some cases of sarcoma of bony origin I have seen a temperature of 103°.

In the very rapidly growing sarcomas of the bone the tendency to rise of temperature is more marked. Involvement or non-involvement of the joint is of the utmost importance in differentiating the two conditions. As stated before, in sarcoma the joint is very rarely involved, never in the early stages, except in the exceedingly rare cases where the sarcoma begins in the synovial membrane (Rydygier). Only 9 cases have been reported.

Examination of the blood shows nothing at all characteristic. There is apt to be a slight leukocytosis, which may reach from 15,000 to 20,000, and occasionally there is an increase in lymphocytes, also an increase in the eosinophiles.

The contour of the tumor is of considerable importance. In tuberculosis starting in the epiphysis and soon involving the joint, the clinical picture is very different. There is swelling of the whole joint, more or less symmetrical, while in sarcoma, especially of the femur, the swelling is apt to be unilateral or more or less irregular, and does not extend into the joint, but further up the shaft of the femur than is seen in tuberculosis. Not infrequently there are areas of softening or fluctuation in sarcoma, which can be made out on deep palpation and are due to the formation of a cyst by liquefaction of bone or cartilage, but this fluctuation almost never communicates with the joint, a fact which enables us to differentiate the trouble from tuberculosis. The color of the skin may be of significance; it is less pale than found in tuberculosis, and at times distended veins give it a bluish color.

While it is always wise, if possible, to have an X-ray photograph made of the tumor, in many cases nothing characteristic will be found, except perhaps in the later stages when the diagnosis is easy without the X-ray. In the

early stages — I agree with Butlin — it is not only of little help, but in certain cases entirely misleading. The X-ray may be important in showing periosteal or central origin of the tumor, but I do not agree with Kramer in regarding it as a valuable aid to diagnosis in the early stages.

The differential diagnosis between sarcoma and syphilitic lesions is not nearly so difficult. There will usually be found evidence of syphilitic trouble elsewhere in the body, even if no history of primary disease can be elicited. In addition to this, the fact of the much slower growth, the location of the tumor in the shaft of the bone rather than the extremity, will be sufficient to establish the diagnosis. There is one other condition, to which I have not seen attention previously called, but which in a case personally observed was mistaken for sarcoma by surgeons of great experience, and that is osteo-arthritis. In this case the X-ray was of decided help, as it showed a much larger amount of new bone formation and this formation much more irregular in character than is often seen in sarcoma. In addition the marked, almost complete ankylosis of the joint was most significant. Finally, further examination showing typical osteo-arthritic enlargement of every joint in both hands, made the diagnosis of osteo-arthritis of the knee certain.

In some cases, and perhaps in the majority, it is be important to establish the diagnosis before the clinical signs are sufficiently marked to render this possible with any degree of certainty. In these cases we may remove a portion of the tumor either by means of a tumor punch, or, better, a simple exploratory incision. I believe that certain risks are attached to these preliminary explorations, due to the possibility of infected cells getting into the circulation, thus setting up metastases in other portions of the body. The advantages, however, to be gained by such positive knowledge of the nature of the growth, enabling the surgeon to apply immediate treatment, whether it be amputation or injections with the mixed toxins, far outweigh the dangers from exploratory incision. If the patient is put upon the toxins within a few days thereafter, I believe that whatever cells may have been carried through the circulation will by that time still

Fig. 1. Sarcoma of femur. Three weeks' duration, following a kick.

be in a state of such unstable equilibrium, that they will probably be destroyed by the toxins. As a matter of fact, the early appearance of metastases after amputation in cases in which no preliminary exploration was made, has proved that the infected cells enter the circulation early in the disease.

I believe it is impossible, in many cases, to make a differential diagnosis between sarcoma and cyst of the long bones, without a careful microscopical examination. In a few cases one may be able to differentiate the two conditions from the following points:

1. Cyst of the long bones is very rare, D'Arcis, in 1906, having been able to collect from the literature but 31 cases.

2. Nearly one-half of the total number of cases have been found in the upper end of the femur, a relatively infrequent seat for sarcoma. Six occurred in the upper end of the tibia, six in the upper end of the humerus.

3. Another important point is that cysts of the long bones are, as a rule, of much longer duration than sarcoma. A history of trauma and spontaneous fracture are found with almost equal frequency in sarcoma and cyst. It should be remembered that many cases reported as cysts of bone were probably sarcoma, as no microscopic examination was made.

If a tumor has developed immediately after an injury and has attained considerable size within the short period of two to three weeks, especially if associated with a certain amount of temperature, there is often a tendency to regard such a tumor as inflammatory rather than malignant. I have recently had two cases which proved that such conditions are not inconsistent with sarcoma.

J. A., aged 12 years, male, always in good health until December 1906. He was referred to me by Dr. Townsend of the Hospital for Ruptured and Crippled, with a history of having been kicked behind the right femur, just above the knee, three weeks before. He came home and complained of the injury to his mother who examined him and found no swelling. One week later he began to have pain in the region of the injury, and the mother again looked him over and discovered a hard, apparently bony swelling in this vicinity. Two weeks later he came to the hospital with a perfectly typical periosteal sarcoma, involving nearly 7 inches of the lower portion of the bone, entirely surrounding the shaft, extending nearly to the knee joint. It measured about 2¾ inches more than the other leg. Exploratory operation by Dr. Townsend showed it to be a round-celled periosteal sarcoma. The toxins were tried for two to three weeks with the hope of avoiding amputation, but while there was a decrease of 1¼ inches in the first ten days, thereafter the tumor increased in spite of larger doses, and amputation below the trochanter was performed and the patient put upon the toxins after recovery from the operation. (See later note.) Fig. 1.

The other case, M. B., aged 9 years, daughter of a prominent surgeon in the South, was brought to me on March 25, 1907, with a history that she had always been in good health up to two weeks before. Two or three weeks prior to this she had fallen from the bicycle, but no special injury was noticed at the time. On the 19th of March, she complained of trouble in her knee. Examination showed a tumor of apparently bony origin, just above the inner condyle, extending nearly around the entire bone. It grew very rapidly in size. Three days later, exploratory incision proved it to be mixed round- and spindle-celled sarcoma. When I saw her, six days from the time of the first discovery of the trouble, there was a tumor involving 5 inches of the shaft of the femur, measuring 2 inches larger in circumference than the opposite side. There had been no pain at any time. The toxins were advised before amputation and continued for about two weeks, with slight diminution at first, but at the end of the first week the tumor continued to increase in size in spite of the treatment being pushed to its limits. Amputation was then advised and performed and the patient put upon the toxins after recovery from the operation. (See later note.)

These two cases show the possibility of a periosteal sarcoma of large size developing within the short period of two to three weeks.

Fig. 2. Sarcoma of femur. Central. Myeloid. Middle third.

Myositis ossificans, especially of the traumatic type, may closely simulate sarcoma of the long bones, as shown by the following recent history.

J. B. N., aged 19 years, male. F. H. good. P. H. Always well until November 17, 1906, when he was injured while playing football. He was struck violently against the right thigh by the shoulder of another player, while making "tackle." There was no external evidence of the injury seen that night, but the next day there was some swelling; two to three days later the leg became stiff, and the stiffness seemed to be confined to the region of the quadriceps muscle, greatly limiting the flexion at the knee. There was no pain at any time, but the swelling steadily increased in size. The patient at first believed the swelling to be in the muscle rather than the bone. The swelling slowly began to get hard and to contract. There was no loss of flesh or deterioration in the general condition. The patient was up and about all the time. He was examined by a number of prominent physicians, and all agreed as to the diagnosis of sarcoma, and amputation was advised. My opinion was asked by letter, and I replied that if the trouble was sarcoma, I would advise the preliminary use of the toxins before amputation. Thereupon the toxins were administered for about four weeks with little reaction and no apparent effect on the size of the tumor.

When I saw the patient, in April, 1907, he stated that the tumor had ceased to show any

Fig. 3. Sarcoma of femur. Upper end.

increase in size prior to the time when the injections were begun. An X-ray photograph had been taken which showed a clearly outlined, apparently bony tumor situated in the middle and lower thirds of the anterior portion of the shaft of the left femur. There were certain peculiarities about the X-ray picture which made me suspicious that the condition was not sarcoma.

1. The swelling was confined almost entirely to the anterior aspect of the femur and showed no tendency to circumscribe the entire bone.

2. The tumor, though apparently reaching down to the periosteum, seemed not to involve the latter; at least, there was a perfectly definite, sharp outline to the periosteal border, absolutely no trace of any erosion.

3. The consistence of the tumor was extremely hard, much more so than is usually the case in periosteal sarcoma.

4. The tumor, although it had grown rapidly for the first two or three months, from that time on showed no tendency to increase in size; it remained practically the same, even before the toxins were begun. This points strongly against sarcoma, inasmuch as such tumors nearly always show constant and steady increase.

In view of these facts, I believed the condition to be one of myositis ossificans rather than sarcoma and advised an exploratory operation. Under ether anesthesia, I cut through skin, subcutaneous tissue and muscular fibres of the quadriceps and came down to a hard tumor, made up entirely of cancellous bone tissue, showing no structures at all similar to sarcoma. A portion of this bone was chiseled off, and careful examination by Dr. W. C. Clark, pathologist to the General Memorial Hospital, and Dr. Jas. Ewing, professor of pathology at Cornell Medical School, proved it non-malignant. They believed it to be myositis ossificans or myo-osteoma, one of the rare conditions which not infrequently occur in the quadriceps muscle following injury, and which have been so well described by Mr. Robert Jones, of Liverpool.

Much that has been said about the diagnosis of sarcoma of the long bones applies equally to sarcoma of bones in general. In different localities there are different symptoms or physical signs of special significance, e. g., in sarcoma of the pelvic bones, ilium or ischium, we often have as an early symptom severe and persistent sciatica or neuralgia of the anterior crural nerve which fails to yield to the ordinary methods of treatment.

More than half of my entire series of cases of sarcoma of the long bones occurred in the femur, i. e., 39 out of 72.

The ages of the patients ranged between 1½ and 58 years. Eighteen of the patients were females, 21 males.

Amputation at the hip joint was performed in 14 cases; high amputation in 10 cases. In the remainder no operation was performed, the disease being either too extensive, or the patients refused an operation, as was the case in 2 or 3 instances.

In 6 cases the mixed toxins were used after operation as a prophylactic against future recurrence.

The results in the 14 cases treated by hip-joint amputation were as follows:

Of 6 cases operated on by myself, all recovered from the operation, but the 5 that were traced all had local or general recurrence within a few months; 4 died within eight months and the fifth within one and one-half year. One patient was lost sight of at the end of three months. In the remainder in which the operation was done by other surgeons and which

came under my observation before or after operation, the results were as follows:

One, a girl aged 13 years, operated upon by Dr. Rushmore, remained well when last seen, five years after operation; 3 died within a year; the remaining 3 were not traced.

Thus, of the 14 cases treated by hip-joint amputation, only 1 was cured, and, without exception, the deaths all occurred within a year after amputation. There seemed to be little difference in the malignancy, whether the tumor was periosteal or myeloid.

Of the cases treated by high amputation below the trochanter, 10 in number, 1 died two years later. (He received toxin treatment for several months after amputation.) One died four months later of metastases in the lungs; a third died seven months after operation of metastases; a fourth died six months after operation.

In the remaining 6 cases the toxins were used in every instance after amputation as soon as practicable after wound healing. All of these cases remain well at the present time, 12, 11, 9, 8, 7 and 2½ months after operation. Two patients gained from 26 to 40 lbs. while under the treatment, and at present there are no signs of recurrence in any case.[1]

Two other cases of sarcoma of the femur in which no operation was performed — in one of which the upper end of the femur was too extensively involved even for hip-joint amputation — must be given in some detail, as the results in these cases were largely responsible for my change of views as to the proper treatment of sarcoma of the long bones.

One of these cases was a round-celled (giant-celled) sarcoma, extensively involving the upper portion of the femur, in a girl of 19, in the service of Dr. Gerster at the Mt. Sinai Hospital. A portion of the tumor was removed by Dr. Gerster and pronounced giant-celled sarcoma by Dr. Mandlebaum, pathologist to the Mt. Sinai Hospital. In addition I sent a section to Dr. Prudden, of the College of Physicians and Surgeons, who pronounced it such a typical case of round-celled (giant-celled) sarcoma, that he said he would be glad to have a section for class demonstration.

The disease was so far advanced that spontaneous fracture occurred, and the patient was removed to the Montefiore Home for Incurables. The mixed toxins of erysipelas and bacillus prodigiosus were given for several months with the result that the tumor slowly disappeared. A sinus persisted for a considerable length of time, but the bone finally reunited, and the patient was presented by Dr. Rogers before the New York Surgical Society several years later. She was perfectly well when I last heard from her, about four years after treatment.

The second case was a male patient, 19 years of age, who had been referred to me by Dr. W. R. Townsend at the Hospital for Ruptured and Crippled, in February, 1902. He had a very extensive, round-celled sub-periosteal sarcoma of the femur, involving the lower two thirds. An exploratory incision was made and a portion of the tumor removed and examination made by Dr. E. K. Dunham, of Carnegie Laboratory, and B. H. Buxton, of Cornell University. Both pronounced it small round-celled sarcoma. Although I believed the prognosis to be practically hopeless from hip-joint amputation, I strongly urged the operation, but the patient and family absolutely refused their consent. I then put the patient upon the X-ray, in February, 1902. The treatment was continued with occasional intervals of rest during the entire spring and summer, with some slight diminution in the size of the tumor. In the fall of the same year he developed a very vascular metastatic tumor in the left pectoral region, the size of a hand. This was removed as far as was possible, though a good deal of tumor tissue was left behind. Very shortly it extended nearly to the umbilicus. The patient continued to lose in weight and strength and finally died of exhaustion October 10, 1907.

The other 2 cases, a boy aged 10 years and a girl of 9, in which a large periosteal round-celled sarcoma of the femur developed two or three weeks after an injury, the toxins were tried both before and after amputation with little benefit. Local recurrence and metastases developed in both cases two months after amputation and death occurred in both within four months after the inception of the disease.

The tumors in these cases represent the most malignant I have ever seen, and that the toxins were not successful in curing them was hardly a surprise. They were used before amputation in both instances, showing marked inhibitory action. This was, however, only temporary.

[1]Since the writing of the paper, 3 of the cases which were alive and well at the time, have shown a recurrence. One case in which there had been a gain of 40 lbs. under the toxin treatment after amputation, the patient began to have neuralgic pains in the sciatic region on the same side, about one year after amputation. A recurrence was suspected, but no tumor was observed until two months later, when an enlargement was discovered in the sacro-iliac region. The patient was re-admitted to the Hospital for Ruptured and Crippled and the toxins were resumed in large doses. There was at first slight diminution in pain, but no material improvement followed the treatment and at the end of two months it was discontinued. The patient failed very rapidly in strength. A hard, bony tumor soon appeared anteriorly, apparently springing from the ilium. This increased in size very rapidly until on September 23d,

Fig. 4. Sarcoma of tibia. Boy of 10 years.

Fig. 5. Sarcoma of radius. Periosteal.

afterward he developed a very large metastatic growth in his left ileolumbar region, fully the size of a child's head. Although I believed his condition hopeless, I put him upon the mixed toxins in large doses. After a few weeks the solid tumor began to soften and soon became fluctuating. I thereupon made a lumbar incision and evacuated between a pint and a quart of broken-down material. The cavity was drained for a long time, but finally healed. At the present time the patient is perfectly well; no trace of sarcoma can be detected, either in the femur or any other part of his body, more than five years since he came under my care, and nearly five years since the treatment was begun. The patient was presented before the New York Surgical Society in November, 1906, and on May 3, 1907, I showed him before the Surgical Section of the Academy of Medicine. (The X-rays were not used in the ileolumbar tumor.)

Sarcoma of the Tibia. With exception of the femur, the tibia is the most frequently affected of the long bones; the fibula much more rarely. The upper end of the bone is usually the site of origin.

In the tibia we are much more likely to find sarcoma of central than of periosteal origin, and the giant-celled type predominates. The disease is much less malignant than sarcoma of the femur, and its course is much slower. In sarcoma of central origin the bone may be gradually destroyed from within outwards until finally only a thin outer shell remains which, on pressure, gives rise to the characteristic eggshell-like crackling sensation. I have observed 14 cases of sarcoma of the tibia and 2 of the fibula. The ages of the patients ranged between 7 and 54 years. In 6 of the cases the tumor originated in the middle portion of the bone, in 4 each at the lower and upper ends.

Methods of Treatment. Amputation above the knee was performed in 6 cases, without mortality; amputation was advised, but refused by the patient in 6 cases; excision was practiced in 2 cases, the mixed toxins being used immediately after operation.

Results. In the 6 cases in which amputation above the knee was done, one, operated upon by myself ten years ago, still remains well; one, operated upon by Dr. McBurney in 1894,

Fig. 6. Sarcoma of tibia. Middle third.

Fig. 7. Sarcoma of humerus. R. Celled. Two months' duration.

died seven months later of metastases; another developed metastases in four months, one in six months; one was not traced; one giant-celled had pleural and lung metastases five and one-half years after amputation (Bull) with death six months later. Hence, of the 6 cases amputated above the knee, only one was permanently cured.

Of the remaining 8 cases, in one, a sarcoma of the middle third of the tibia, recurrent after operation, I decided to use the mixed toxins before sacrificing the limb. The toxins were begun in February, 1899, and continued for two to three months, with the result that the tumor entirely disappeared, and the patient is still in good health, working upon his farm in Chesley, Ont., eight years afterward. Microscopical examination in this case was made by Dr. John Caven, Professor of Pathology at the University of Toronto, Canada, who pronounced it spindle-celled sarcoma.

In another case, a sarcoma of the lower end of the tibia, two operations of partial excision were performed by Dr. Gibney, immediately followed by the injections of the mixed toxins. Recurrence took place also after the second operation. The injections were kept up for more than six months, during the latter part in conjunction with the X-ray. The tumor finally disappeared, and the patient is well and free from recurrence at the present time, nearly three years later. I saw her two days ago The other cases in which operation was refused have not been traced.

Sarcoma of the Radius and Ulna. Five cases, 3 of the radius and 2 of the ulna.

One case, a sarcoma of the ulna, in which amputation was performed in 1898, by Dr. Geo. Tully Vaughan, for a round-celled sarcoma of the ulna, following a "greenstick" fracture, recurred eight years afterwards in the abdomen.

The patient was referred to me by Dr. J. W. Perkins of Kansas City, in October, 1906, with a very extensive recurrence, the whole abdomen being filled up with a solid mass, presenting the appearance of the abdomen of a woman eight months pregnant. There was no ascites. The patient was immediately put upon the toxins which were given in the pectoral region. There was prompt and rapid improvement which has continued up to the present time. The masses in the abdomen have diminished; they are now not more than one third of their original size, and the patient's general health is much improved. This patient was shown before the meeting of the American Orthopedic Association, May 8, 1907.

Sarcoma of the Humerus. Sarcoma of the humerus is very rare and exceedingly malignant. The upper end of the bone is most frequently involved, but the whole shaft is quickly invaded; the surrounding tissues are infiltrated. In a case which was personally observed and in which I performed amputation at the shoulder joint, half the clavicle was involved and most of the scapula. The disease quickly recurred in the portion of the clavicle remaining, with metastases in the spine. In sarcoma of the humerus, there seems to be a special proneness to recur in the opposite humerus; this has been noted in 2 cases personally observed.

While diagnosis ought to be possible in the early stages, a study of the reported cases will show that early diagnosis is seldom made. In 2 cases the patients were treated for rheumatism until the tumors were about the size of a cocoanut. The rapidity of the growth was undoubtedly enhanced in the one case by the electric vibrator treatment, and in the other by vigorous application of osteopathy. In neither case had there been any history of previous rheumatism.

Fig. 9. Sarcoma of humerus. Round celled. Periosteal.

Fig. 8. Sarcoma of humerus. (6 months' duration). Periosteal. Round celled. Right half of photo shows sarcomatous thrombi, in both subclavian artery and vein.

The sudden discovery of a hard, painless swelling in the humerus, especially in its upper portion, with or without previous injury, in an apparently perfectly healthy individual, should arouse strong suspicion of the presence of sarcoma. Almost the only condition likely to be mistaken for it would be a chondroma, which is much rarer and of very much slower growth. The following case illustrates well the history of the sarcoma of the humerus.

Sarcoma of the Humerus. G. W., female, 16 years of age; Stamford, Conn. F. H. Negative. P. H. No injury. In the latter part of January, 1907, the patient first noticed a dull aching pain in the right shoulder, which was worse at night. A few weeks later, a swelling appeared which grew in size very rapidly. She then consulted Dr. Gibney at the Vanderbilt Clinic in the early part of June, 1907. An X-ray photograph was taken which confirmed the clinical diagnosis of sarcoma of the humerus. The patient was referred to me by Dr. Gibney and admitted to the General Memorial Hospital on June 14, 1907. General condition was perfect. Physical examination at this time showed the upper end of the humerus occupied by a large tumor, largest circumference at the upper extremity of the humerus, globular in shape, gradually tapering downwards, its lower portion being simply a fusiform enlargement of the shaft of the humerus. Figs. 8 and 9.

Measurements: Right axilla, passing over the acromion process of the clavicle, 15 inches; left axilla, passing over the acromion process of the clavicle, 14 inches; 3 inches further down showed 13 inches on the right, 9¾ inches on the left side; 6 inches down showed 10¼ inches on the right, 8½ inches on the left side.

A preliminary trial with the toxins was given for four weeks, the patient receiving 23 injections in all. At first there was slight diminution in the size of the growth, but later the tumor began to increase again. The injections were given partly into the tumor itself, partly into the pectoral region, and a temperature as high as 105° was obtained. At the end of two weeks' treatment operation was advised, but the family would not consent until two weeks later, when intrascapular thoracic amputation with resection of the clavicle and preliminary ligation of the subclavian artery and vein was performed. The glands were found extensively involved. On cutting through the vessels, the lumina of both artery and vein were found obliterated and occupied by large thrombi of sarcomatous material. The nerves were injected with a one-tenth per cent solution of cocaine, before they were cut. There was very little loss of blood and practically no shock, and the patient made an uninterrupted recovery.

October 2, 1907: The patient's general condition seems perfect; she has gained considerably in weight. There is, however, evidence of a local recurrence just below the clavicle and in the upper part of the right breast. The mixed toxins were resumed on October 10th. November 8, 1907, the evidences of recurrence have disappeared. December 24, 1907, the patient has gained 4 pounds under treatment, and is still free from any signs of pecundate.

The growth in sarcoma of the humerus is so rapid that one can see its increase in size from day to day. In the cases that I have observed, 15 in number, pain has been a fairly early sign, but has not been severe until the tumor has reached considerable size. The tumor originated in the upper end of the bone in all cases except 1, in which it started in the middle. The pain was never marked, except in the later stages of the disease. Sarcoma of the humerus shows a greater tendency to infiltrate the neighboring tissues, both bone and soft parts, than sarcoma in any other locality. The axillary glands are not infrequently involved, and the scapula and clavicle are early invaded by the disease. The almost hopeless prognosis in these cases is shown by the collections of Barling and Dent.

Of the 14 patients in my series, 6 were females, 8 males, and their ages ranged between twenty months and fifty-eight years; 6 were under twenty years of age and only 3 over thirty years. Antecedent injury was noted in 4 of the 14 cases. In 10 of the cases the tumor had been observed less than six months; in 3 cases from one to three months.

Methods of Treatment. In 4 cases amputation was refused, though strongly urged. Amputation at the shoulder joint was performed in 6 cases, with 1 death from shock. (In this case the tumor was very large. I saw the patient in consultation and advised operation, but it was performed by another surgeon.) Resection was performed in 3 cases.

In the 6 cases in which shoulder-joint amputation was done, 1 died of the operation and the remaining 5 all died within four to ten months. Of the 3 in which excision was performed 2 were lost sight of. The third is the case of Dr. Blake, of Boston, which I have already reported at length in a former paper. The head of the bone was excised, but the disease now involved both the clavicle and scopula. Amputation of the entire upper extremity with clavicle and scopula was advised but refused. The patient was immediately put upon the toxins with completed recovery; she is now well, more than nine years after.

She was shown by Dr. Blake at a meeting of the Suffolk County Medical Society, November 14, 1907, in perfect health more than nine years later. She had perfect use of her arm.

In 4 cases the mixed toxins were used after operation, twice after amputation, once after excision. The 3 cases in which the toxins were used after amputation were treated by myself, and in two cases the toxins failed to check the return of the disease or to prevent a fatal issue. A third case is still under treatment. Yet, the fact that the only cure in the entire series of 15 cases (Blake's) was undoubtedly due to the toxins, is sufficient to justify the use of the toxins after operation.

Final Results in Sarcoma of the Long Bones. Ten patients have remained well over three years. One patient with sarcoma of the femur was well five years after hip-joint amputation; another was well after five years, no operation, medicinal treatment,— diagnosis in this case was probably erroneous; 1, a subperiosteal round-celled sarcoma of the femur with metastases, well after five years, treated with the toxins, without operation; 1 of the

tibia remains well eight years after treatment with the mixed toxins, without operation; 1 of the tibia, well ten years following amputation of the thigh; 1 of the tibia, well five and a half years after, then developed metastases in the lung; 1 of the tibia, well two years after, recurrent twice after conservative operation, the tumor disappeared under the toxins and X-rays, patient well at present; 1 of the humerus, well after nine years after resection, followed by the mixed toxins; 1 of the radius, well six years after resection; 1 of the ulna, well eight years, then developed extensive abdominal metastases; 1 of metatarsal bone, well five years, amputation of leg, middle and lower third, mixed toxins after operation, four months.

The prognosis of sarcoma of the long bones in general I have discussed fully in a recent paper (loc. cit.).

Prognosis of Sarcoma of the Short Bones, e. g., metacarpal and metatarsal bones, clavicle, is exceedingly grave. Fortunately, sarcoma in these bones is extremely rare. I have seen only 2 cases of sarcoma of the metacarpal, 1 of the metatarsal, and 7 of the clavicle.

One of my cases of sarcoma of the metacarpal bone was not traced. In the other case the tumor developed immediately following a blow upon the hand. I saw the case about four months after the injury. An exploratory excision was made and microscopical examination proved the growth to be an alveolar round-celled sarcoma. Immediate amputation of the forearm was done. In four weeks there was multiple recurrence in both breasts, quickly followed by general metastases in the liver and abdomen, with death in six weeks.

In the one case of sarcoma of the metatarsal bone I have had, the tumor grew with almost equal rapidity. In this case I performed amputation in the middle of the leg, immediately placing the patient upon the injections with the mixed toxins, which were continued for nearly six weeks. The patient is at present still well, more than five years later.

In one of my cases of sarcoma of the clavicle, the tumor developed with tremendous rapidity, causing death in about four weeks. I have never seen a case of sarcoma of the clavicle recover.

Sarcoma of the Large Bones, e. g., ilium, ischium, or any of the pelvic bones, after operation, is very grave. The disease can rarely be fully removed, and speedy recurrence is the rule. I have had one case of very large inoperable sarcoma of the ilium, apparently cured by the mixed toxins.

Fig. 10. Sarcoma of lower jaw. Local recurrence ten years after excision.

The Prognosis of Sarcoma of the Phalanges of the Fingers, or short bones, is much better than in sarcoma of the metacarpal bones. Immediate amputation has been the rule, as soon as the diagnosis has been made. One of my own cases, a periosteal sarcoma of the ring finger, in which the diagnosis was confirmed by Dr. W. H. Welch, of Johns Hopkins, and Dr. B. H. Buxton, of Cornell, and a number of other pathologists, the patient was unwilling to consent to an amputation. She was immediately placed upon the mixed toxins, and the treatment continued with intervals for upwards of six months. She is now in perfect health, without any signs of a recurrence, more than eight years later. Two cases of sarcoma of this jaw have been apparently cured by the toxins. One case an inoperable round-celled sarcoma of the upper jaw with probable abdominal metastases (microscopical examination by Dr. William H. Welch), entire recovery and patient well six years later. This case was treated by another physician under my direction (see N. Y. Med. Record, May 3, 1902). A second case of spindle-celled sarcoma of lower jaw treated by myself. Entire disappearance, and patient well December, 1907, 1 year.

Fig. 11. Sarcoma of ilium.

Sarcoma of the Spine. I have observed six cases. One case, starting in the middorsal spinous process, of the spindle-celled type, disappeared under the toxins and was well when I last saw her, nearly ten years after recovery.

Another case, involving at least 4–5 bodies of the vertebra, is of very great interest.

Round-celled Sarcoma of Dorsal Spine. Mr. G., aged 20 years. Diagnosis confirmed by Dr. Harlow Brooks, pathologist of the Bellevue Hospital. The tumor was of enormous size, involving the lower dorsal and upper lumbar vertebræ. The patient had lost about fifty pounds in weight, and there was so much pressure upon the spinal cord that there was total paralysis of the lower extremities, bladder, and rectum, and he was so weak that he was unable to turn over in bed. Seen in consultation with Dr. V. P. Gibney, of the Montefiore Home, in February, 1902. The mixed toxins of erysipelas and bacillus prodigiosus were begun and continued by the house staff under my direction; daily injections were given up to the following May, and severe reactions, temperature of 103° to 104°, followed most of the injections. Patient began to show improvement, local as well as general, almost at once. By September he was able to get out on crutches. In November he was shown before the New York Surgical Society. At that time he had regained nearly his normal weight and got about very well with the aid of a cane. In February, 1903, one year after treatment, he was able to walk perfectly well without support of any kind, and his general health had become perfect. He was able to resume his former occupation.

This I believe to be the most remarkable result ever obtained from the use of the toxins. Fortunately, there can be no doubt as to the diagnosis, since the tumor was not only examined by well-known pathologists, but specimens of the tumor have been preserved. I have shown this patient before various medical societies the past two years. He remains in perfect health, five years after treatment, and he was presented before the New York Academy of Medicine May 13, 1907.

Treatment. What are the modern methods of treatment of sarcoma of the bone? First, with reference to sarcoma of the long bones: The almost universal rule among the best surgeons of the world is immediate amputation of the limb, usually a disarticulation at the proximal joint. A few surgeons will be found, following the lead of Mikulicz, who will advise

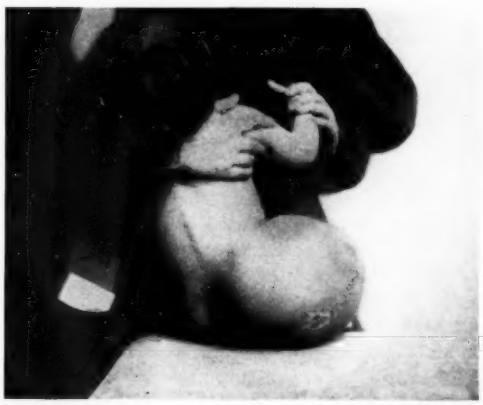


Fig. 12. Sarcoma of ilium in child 18 months old.

complete or partial resection instead of amputation in cases of sarcoma of the myeloid type, especially of the tibia or radius. The usual unfortunate end of amputations I have already attempted to show. In the periosteal type of sarcoma of the long bones, especially the femur and humerus, not only is the limb sacrificed, but in the great majority of the cases there is failure to save the life of the patient.

The gloomy prognosis of sarcoma of the long bones, even in face of such radical operations as amputation or exarticulation at the proximal joint, is still further emphasized by Butlin who, in a series of 68 cases of sub-periosteal sarcoma of the femur collected mostly from English and German clinics, reports only 1 case that remained well beyond three years, and in this case there was some reason to believe that the disease was of central rather than periosteal origin. Of 46 cases of sarcoma of the femur, of the myeloid type, collected by Butlin, 5 remained well beyond three years. In the cases of sarcoma of the tibia and fibula, the results were little better. Of 35 cases of the sub-periosteal type, only 1 remained well beyond two years, while of 52 cases of the myeloid type, 9 were well beyond three years. Butlin was able to collect only 18 cases of sarcoma of the humerus of the periosteal type that had recovered from operation. Of these only 1 was known to have been well beyond three years; of 10 of the myelogenous type, 2 were well beyond three years.

Butlin concludes: "We cannot but form the opinion that the disease (periosteal sarcoma of the humerus) is horribly and rapidly fatal and that the prospect of complete cure, or even long immunity from recurrence, is singularly small." Of the sub-periosteal sarcomas of the femur, he states: "The cases which were followed up by Mr. Colby and myself were almost invariably fatal, and in the large majority of them death occurred within a few months of the amputation. In many of the cases amputation was performed within three months of the first observation of the disease; in some of them within a few weeks. From every point of view, I cannot but regard sub-periosteal sarcoma of the femur as a remarkably deadly disease, and I am not yet clear that surgery can do more than palliate the distress occasioned by it, and that only in a comparatively few cases. The only hope of the future is in very early diagnosis and in very high amputation."

In sarcoma of central origin the lives of a certain number of patients are saved by operation, but the limb is sacrificed. In a still smaller number of cases of the myeloid type both leg and life are saved by resection.

Such, in brief, are the results of modern methods of treatment of sarcoma of the long bones, and they form one of the most gloomy chapters in the history of modern surgery.

In a recent paper on Sarcoma of the Long Bones (Annals of Surgery, March, 1907) I advocated a new departure in the treatment of sarcoma of the long bones. Up to a comparatively recent period, I had been one of the staunchest advocates of early and high amputation for these conditions. I was led to change my opinion for two reasons:

1. The almost complete failure to save the patient's life after the sacrifice of the limb; especially in sarcoma of periosteal origin.

2. The fact that in a number of apparently most hopeless cases in which amputation was refused, or considered impossible, the tumors had disappeared under the treatment with the mixed toxins, with the result that the limb as well as the life was saved.

In my opinion, a sufficiently large number of such results have been obtained, by others as well as myself, to warrant one in advocating as a routine procedure, in cases of sarcoma of the long bones, the preliminary use of the mixed toxins before sacrificing the limb. The same would apply to sarcoma of the lower jaw. I have had one case in which the preliminary use of the toxins rendered excision unnecessary. There are now on record 13 cases of sarcoma, in which the limb as well as the life of the patient has been saved by the use of the toxins. Of these 8 are well from four to nine years.

In a certain, and probably large proportion of cases, especially those of periosteal sarcoma of the femur and humerus, in which the growth is extremely rapid, the toxins will probably fail to check the progress of the disease. This can be determined in a very short time, say two to three weeks. If the tumor is not brought under definite control within this time, I would advise immediate amputation, followed by the

prolonged use of the toxins as soon as possible after recovery from the operation. In cases of myeloid sarcoma I believe that resection should be the operation of choice. The toxins to be used in these cases also, as soon as the patient has recovered from the operation. The cases of sarcoma of the femur already cited, in which the toxins were used after operation, together with upwards of 20 cases in which the toxins have been used after primary operation of sarcoma of the soft parts, have been followed by such an insignificant proportion of recurrences, as to practically establish the value of the treatment as a prophylactic measure.

The use of the mixed toxins of erysipelas and bacillus prodigiosus for sarcoma is no longer in its experimental stage, as I have attempted to show in my article in the American Journal of the Medical Sciences, March, 1906. This paper contains a report of 36 cases of inoperable sarcoma in which the toxins had been used with success during the last fourteen years.

Twenty-six of these cases were well and free from recurrence from 3 to 13 years.

Twenty-one of these cases were well and free from recurrence from 5 to 13 years.

The same paper contains a tabulated report of 60 cases of inoperable sarcoma successfully treated by other surgeons, of which 27 are alive and well from 3 to 12 years. Of these 22 were round-celled sarcoma, 14 spindle-celled, 3 mixed-celled, 3 endothelioma; in 16 no microscopical examination was made. This is sufficient refutation, I think, of the statement occasionally made, that the method has been successful only in the hands of its author.

Since the publication of this paper I have had 8 other successful cases, making a total of 44. Of these 17 were round-celled sarcoma, 17 spindle-celled sarcoma, 2 mixed-celled, 1 chondrosarcoma, 1 epithelioma. In the remaining 5 no microscopical examination was made, but the clinical features of the cases were such as to leave hardly any doubt as to the malignancy of the disease.

With regard to the late results of these cases:

Twenty-one were alive and well from 5 to 15 years.

Twenty-seven were alive and well from 3 to 15 years.

Ten were alive and well from 10 to 15 years.

These clinical results have recently been supplemented by the experiments of Dr. Martha Tracy[1] and Dr. S. P. Bube, of the Huntington Cancer Research Fund, at the Loomis Laboratory. The mixed toxins of erysipelas and bacillus prodigiosus injected systematically into dogs with multiple sarcoma, caused entire disappearance of the tumors within a few weeks. Dr. Tracy also demonstrated that the toxins of the bacillus prodigiosus produced the same results, though less rapidly than the combined toxins, thus proving my previously expressed belief that the prodigiosus had an inherent value of its own aside from its power to increase the virulence of the streptococcus when grown together.

In view of Dr. Tracy's experimental demonstration of the important and independent part played by the bacillus prodigiosus in the curative process it occurred to her that the way to standardize the preparation and make it possible to estimate more accurately its strength and dosage, would be, to grow the two organisms separately, reduce the bacillus prodigiosus to a dry powder, add so many milligrams by weight per cubic centimeter to the sterilized streptococcus broth. Her process in detail is as follows:

Streptococcus culture in broth — three weeks' growth, 100 c.c.

Prodigiosus suspension, containing 750 milligrams of prodigiosus proteid, 30 c.c.

Glycerin, 20 c.c.

Each cubic centimeter of the mixture then contains 5 milligrams of the prodigiosus proteid. Considering 1 oz. to be equal to 29.57 c.c., it contains 147.85 milligrams prodigiosus proteid; 1 c.c. equals about 17 minims, so 1 minim contains about 3 milligrams of prodigiosus.

The prodigiosus suspension used is made and measured in the following way: Prodigiosus is grown on agar for ten days. There is then a thick red growth, which is scraped off with glass rods and rubbed up with a mortar and pestle to a smooth, rather thick suspension, using physiological salt solution as diluent. This suspension is sterilized by heat — one

[1] The results of Dr. Tracy's experiments were reported before the Section on Pathology at the recent meeting of the Amer. Med. Assoc., October, 1907.

hour at 75°. The total nitrogen per c.c. is determined, and the weight of nitrogen per c.c. multiplied by the factor 6.25 gives the weight of proteid present. Thus the weight of prodigiosus proteid in each c.c. is known, and the suspension is diluted to the required strength before mixing with the streptococcus culture. After mixing and bottling the toxins, the mixture is again sterilized two hours at 75°.

The toxins made in this way I have used almost exclusively during the past six months, and I believe that they are not only more powerful than the earlier preparations, but more efficient.[1]

A word of warning should be said in regard to the dangers attending the use of such a powerful preparation as the mixed toxins. If proper precautions are observed, I believe the toxins may be used with almost perfect safety. In about 400 cases in which I have used the mixed toxins during the last fifteen years there have been only 3 cases in which death could, possibly, be attributed to the injections. All 3 of these cases were in the last stages of the disease, suffering from extensive metastases, associated with very feeble heart action. Two of the cases presented extensive involvement of the mediastinal glands. In both of these cases the treatment had only just been begun for two or three days and sufficient doses had not been given to produce any marked reaction. The patients died suddenly, apparently as a result of an embolus.

It is most important to begin in every case with a very small dose, not over ¼ minim (diluted with a little boiled water to insure accuracy of dosage). If the tumor in question is highly vascular, it is wiser to begin the injections remote from the same, until the susceptibility of the patient to the toxins has been ascertained. This varies considerably in different individuals. After a few doses it is safe, in most cases, to inject into the tumor itself.

[1] Parke, Davis & Co. are making the toxins according to the recent modifications, and they are putting forth every effort to bring the preparation up to the standard obtained by Dr. Tracy.

As a rule, when giving injections into the tumor, only about one fifth of the dose used for injections remote from the tumor is required to produce the same reaction. The dose should be increased by ¼ minim when given into the tumor; by ½ minim when injected remote from the tumor, until the desired reaction is obtained. The best results are obtained by doses sufficiently large to produce severe reactions, say a temperature of 102° to 105°.

The frequency of the injections must depend entirely upon the strength of the patient, some being able to bear daily injections, while in others it may be unwise to push the treatment beyond three or four injections a week.

In the successful cases the effect is usually very promptly noticeable. The tumor becomes smaller in size, much more movable, and very much less vascular. These changes appear very quickly, often within two to three days.

The action of the toxins is both local and systemic. Sometimes the best results are obtained by giving the injections alternately into the tumor and remote from the same. In tumors in inaccessible regions, e. g., intra-abdominal sarcoma, or sarcoma of the tonsil, a perfect cure may be obtained entirely by systemic injections. Care must be taken not to give sufficiently large doses to break down the tumor more rapidly than it can be absorbed, especially in case of intraabdominal sarcoma.

When used after operation as a prophylactic against recurrence, smaller doses will suffice, and the treatment need not interfere with the regular routine of life.

In conclusion, I desire to express my sincere thanks to Dr. Virgil P. Gibney as well as to Dr. Wisner R. Townsend and Dr. Royal Whitman for a generously placing at my disposal the large number of cases of bone sarcoma occurring in their clinic at the Hospital for Ruptured and Crippled during recent years.

For bibliography, Vide "Sarcoma of the Long Bones," Coley. — *Annals of Surgery*, March, 1907.

THE GENERAL PRINCIPLES OF ABDOMINAL SURGERY

By RUTHERFORD MORISON, F.R.C.S., Newcastle-on-Tyne, England
Senior Surgeon Royal Victoria Infirmary, and Lecturer on Surgery, Durham University College of Medicine, Newcastle-on-Tyne, England

WHENEVER we can think in terms of accepted general principles, it is always wise to do so. We are spared confusion and bewilderment of thought, and enabled at the same time to connect and to retain scattered items of knowledge which are liable, for want of such connection, to miss their true significance and to slip rapidly from the memory. The general principles of surgery apply to every part of the body, but there are certain points to which attention may be usefully drawn when the abdomen is under special consideration. Here, as elsewhere, inflammation has for its recognised cause infection by organisms.

Acute inflammation is due to pyogenic organisms, and in the abdomen the chief of these is the bacillus coli.

Chronic inflammation is traceable to the activity of the organisms of tubercle and syphilis.

The terminations of acute inflammation in the abdomen as elsewhere are:

1. Resolution.
2. Fibrosis.
3. Partial destruction.
4. Total destruction.

This knowledge applied to a consideration of conditions met with in the abdomen prevents confusion and renders some otherwise obscure problems comparatively easy of solution. Applied, for example, to three diseases much discussed at the present time, viz., appendicitis, cholecystitis, and pancreatitis, it shows how the pathological conditions prevailing agree with what would be expected on general principles; it explains how the appendix, the gall-bladder and the pancreas may each become fibrosed; how each may ulcerate or suppurate and slough; and how under the most serious conditions gangrene may represent the final stage of each of these diseases.

With regard to chronic inflammation—which in the abdomen is nearly always due to

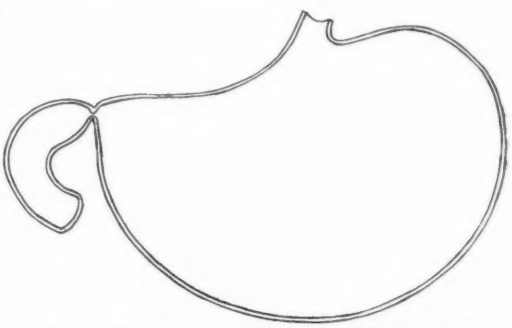


Fig. 2. Stomach, with stricture of pylorus. Large cavity. Thin walls.

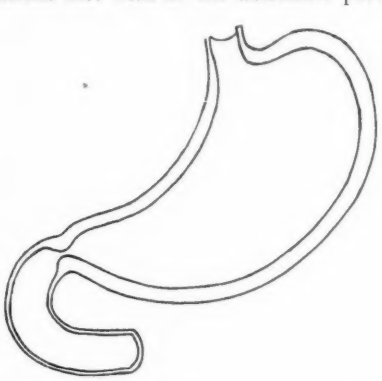


Fig. 1. Stomach, with stricture of pylorus. Small cavity. Thick walls.

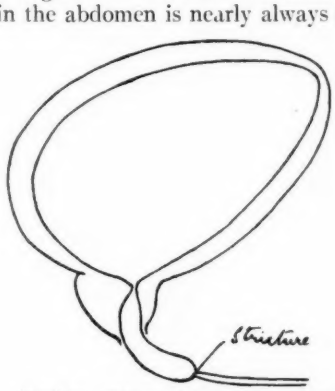


Fig. 3. Bladder, with stricture of urethra. Small cavity. Thick walls.

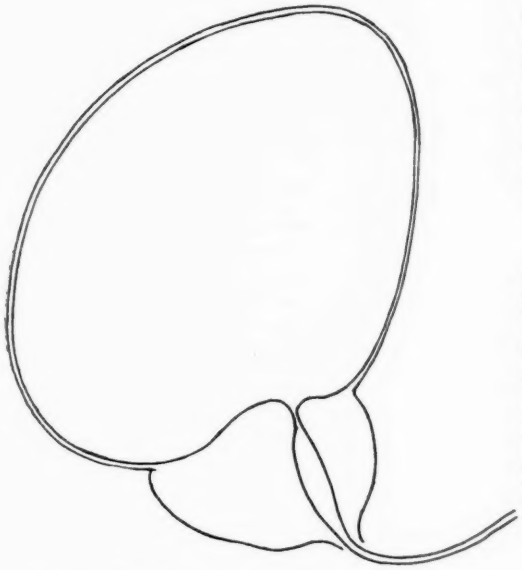


Fig. 4. Bladder, with enlarged prostate. Large cavity. Thin walls.

tubercle— the same rule of thought applies, for the difficulties which confront the surgeon are usually those which he is accustomed to associate with the presence of tubercle elsewhere. There is the same tendency to infect lymphatic glands and soften and break them down, the same slow obstinate ulceration, the same natural cure by fibrosis, the same clinical tendency to mislead in diagnosis by the occasional mimicry of malignant growths and ulcers, and the same need for remembering the specific underlying disease as a frequent cause of obscure or indefinite tumours or fluid effusions.

CALCULI

Much discussion has arisen lately as to the cause of calculi. All recent writers suggest microörganisms as the cause of such of them as are produced in sites communicating with the alimentary canal, and judging from what has been observed elsewhere the explanation is probably a correct one in some cases. Phosphatic calculi are of frequent occurrence in septic bladders and kidneys, and the septic bacteria present are most probably responsible. On the other hand, it is clear that no theory on the subject can be regarded as entirely satis-

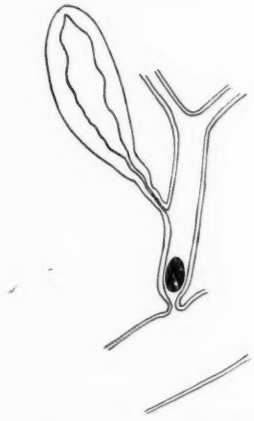


Fig. 5. Gall-bladder, with common duct stone *not* large enough to fill distended common duct. (Partial obstruction.) Small cavity. Thick walls.

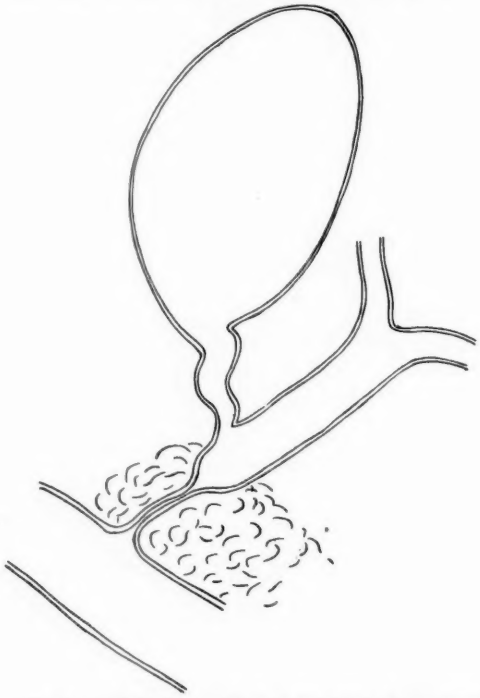


Fig. 6. Gall-bladder, with enlarged head of pancreas and distended common duct. Large cavity. Thin walls. (Complete obstruction.)

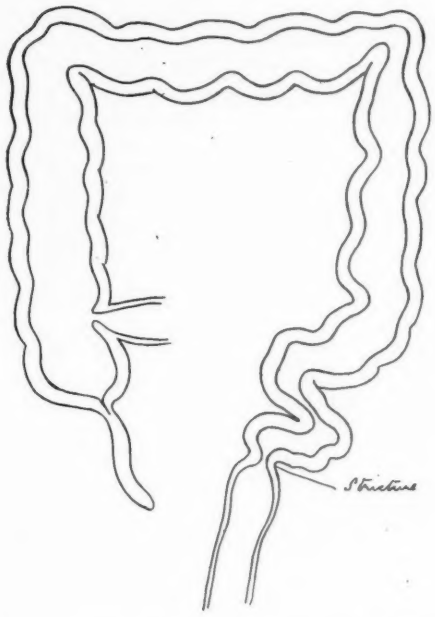


Fig. 7. Caecum and colon, with stricture of sigmoid. Small cavity. Thick walls. (Partial obstruction.)

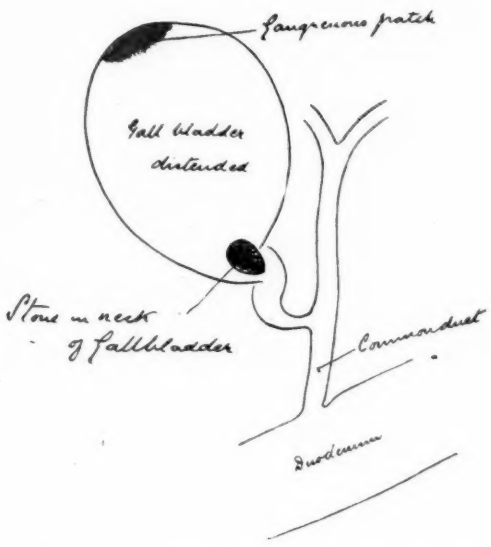


Fig. 9. From acute gall-stone attack of four days' duration.

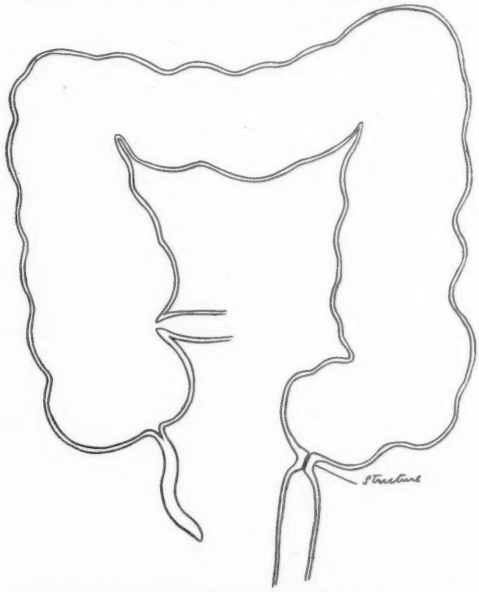


Fig. 8. Caecum and colon, with tight stricture of sigmoid. Large cavity. Thin walls. (Complete obstruction.)

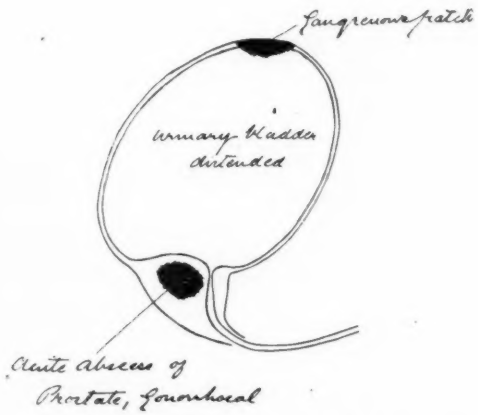


Fig. 10. The gangrene followed three days of complete obstruction.

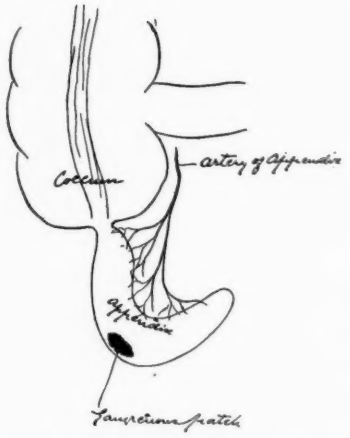


Fig. 11. From an acute appendicitis of twenty-four hours' duration.

factory which does not explain the occurrence of calculi in every situation in which they appear, and under all the circumstances of their production. It is more probable that salivary, cerebral, biliary, vascular, intestinal, urinary and other calculi all own the same general cause, and that it remains as yet unknown.

A fashionable disease known as "mucous colitis" is not uncommon. A few of its victims have such a tendency to form grit that they pass it from the bowel in large quantities as intestinal sand. The capacity of some persons for the formation of urinary gravel has to be seen, in order to be believed. To explain these cases by the microbic theory would postulate the exercise of such prodigious microörganic activity as to be inconceivable, in view of the local and general conditions of health observable in patients at the time. From a practical standpoint calculi are to be regarded as foreign bodies, for they behave as such. Like foreign bodies, when undisturbed and quietly resting, they cause no serious trouble and but few symptoms. Like foreign bodies they weaken the normal resistance of the surrounding tissues and predispose to infection. As in the case of foreign bodies, when once infection has occurred it is difficult to get rid of, until the calculus has been removed or extruded. No one possessing a knowledge of these facts could be surprised to learn either that biliary, renal, salivary, bladder, or intestinal calculi may be present without symptoms, or that once infection has occurred in connection with any of them serious troubles are likely to follow.

But the results dependent on the presence of calculi in the abdomen cannot be understood, unless the conduct of the hollow viscera in which they are contained is fully appreciated. All of these viscera possess the power of contraction, by virtue of the unstriated muscle in their walls.

The ordinary contractions of unstriated muscle are not perceived; they are painless. The forcible contractions of unstriated muscle are well-nigh unendurable; they cause the most severe pain that human beings can experience. All the colics are pathological examples of this fact, labour is a physiological analogue.

The most usual stimuli to forcible contraction are the presence of a foreign body plus inflammation, or rapidly increased tension. An excess of carbonic acid, such as accumulates in the blood during sleep, is a predisposing cause of active contraction in unstriated muscle; hence the frequency with which colic awakens the patient in the early hours of the night when sleep is deepest. Exhaustion of the muscular

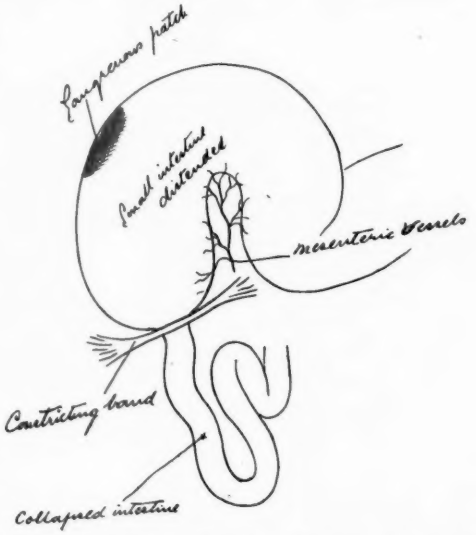


Fig. 12. From a case of acute intestinal obstruction of two days' duration.

walls follows prolonged and intense effort, and relief from the severe pain results, even though its cause be not removed. Instances of this in the urinary and gall bladders, the intestine, the ureter, the bile ducts, and the pregnant uterus, are not rare.

All the hollow viscera react in a similar manner to stimuli. If the obstacle to be overcome is partial obstruction, their walls thicken from hypertrophy and their cavities diminish. If the obstacle prove invincible, the muscular walls cease to contract, the violent pains abate, paresis of the muscular coat occurs and is followed by passive distension of the viscus and degeneration of the unstriated muscle. Painless urinary retention with overflow is thus explained; so are hydrops of a gall-bladder distended by its own secretion, and the large gall-bladder dependent on a complete and chronic obstruction of the common duct; so are painless distension of the caecum following on a block of the sigmoid flexure; the enormous painless distension of the stomach resulting from obstructed pylorus; hydrosalpinx following occlusion of the Fallopian tube and hydrops of the vermiform appendix.

If active inflammation is superadded to obstruction, the intravisceral tension may become so acute that partial or total gangrene of the involved viscus, to be followed by its rupture, will take place. It is a very general belief at present that gangrene of the abdominal and pelvic viscera is the direct result of infection by specially virulent organisms. That some rare forms of gangrene are due to this cause is undoubted, but in these regions, as in others, we believe that gangrene is in general directly due to a mechanical interference with the circulation in the nutrient blood-vessels of the parts concerned, and that infection and inflammation, by causing intravisceral tension, are often exciting causes of the circulatory disturbance. We think that evidence of this is forthcoming in the fact that gangrene commences at a site furthest from the vascular supply. We have had opportunities for observing that in the gall-bladder a gangrenous patch is observed first at the fundus; in the urinary bladder at the superior portion of the posterior wall; in the appendix and small intestine at a point opposite the mesentery; in the caecum in the neighbourhood of its anterior longitudinal band; and that in each instance it appears as a rounded or oval patch, so placed as to be furthest from the vascular supply of the viscus involved.

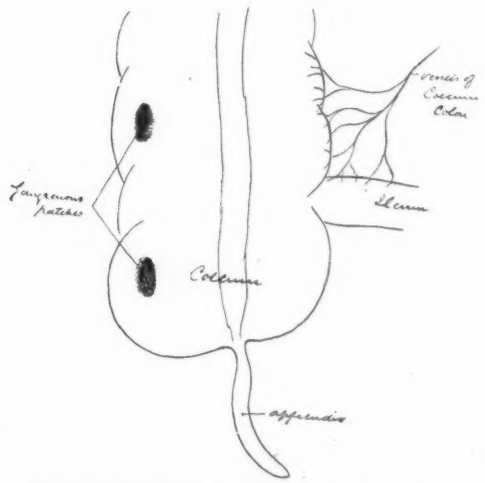


Fig. 13. From a case of stricture (malignant) of the sigmoid flexure, causing complete obstruction of two weeks' duration.

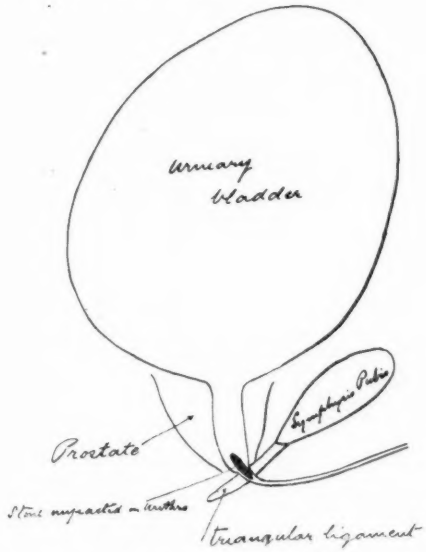


Fig. 14. A stone of this size will cause complete obstruction. (Drawing reduced one-half.)

Another fact which should be remembered is that muscular tubes, such as the intestine, urethra, bile duct, and ureter, may all behave in the same way when a foreign body attempts to pass through them. A relatively small body, such as a stone of moderate size, may set up violent spasmodic contraction and be so tightly gripped as to cause, temporarily, complete obstruction. At a later stage the walls of the muscular tube recede from the foreign body, and active dilatation follows. The temporary attacks of intestinal obstruction, caused by the passage of a gall-stone through the intestine, may be thus explained; so may intermittent hydronephrosis from a stone in the ureter; and intermittent jaundice from a stone in the common bile duct.

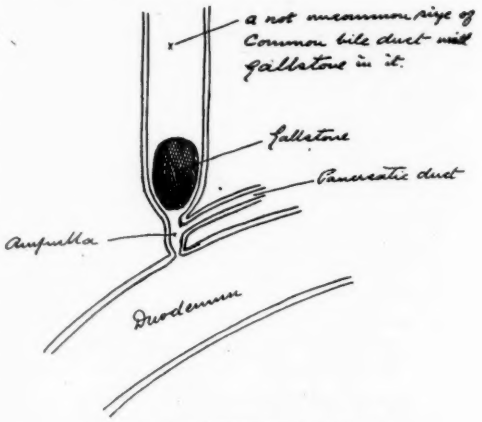


Fig. 16. Drawing reduced one-half.

SACCULI

The importance of grouping together similar structures, in order to understand pathological possibilities, is well demonstrated by the discovery of sacculi. Sacculation of the urinary bladder is well known. Similar changes have

Fig. 15. Size of gall-stone which caused jaundice and death by occluding the common bile-duct. The gall-bladder and common duct had been cleared (?) by operation two weeks previously, and this stone only was found post-morten. The patient whilst convalescent was seized with a severe attack of biliary colic. Next day was jaundiced, and died suddenly syncopal three days later.

been found in the intestines, especially of the colon, in the gall-bladder, the vermiform appendix, and Fallopian tubes, indeed it is safe to say that they will be found, if sought for, in any of the hollow muscular-coated viscera. The exact pathology in all is obscure, but they all, excepting the congenital types, probably have as in the urinary bladder some relation to inflammation of the walls and obstruction of the outlet.

SOME FUNCTIONS OF THE OMENTUM

A special protective agency exists in the abdomen but for which many abdominal diseases and operations would be attended by a much higher mortality than they are. The omentum, in addition to other uses, may be regarded as the "abdominal policeman." It travels about in the abdomen with considerable activity and is attracted by some sort of information to neighbourhoods in which mischief is brewing It may effect a radical cure of hernia by blocking the hernial orifice with an omental plug. It surrounds and adheres to a recently reduced strangulated and damaged loop of intestine, and may keep it alive and prevent a leak. It is generally found in the neighborhood of a diseased or inflamed appendix, and by wrapping it up, if gangrenous, or by locking up the pus from an appendix abscess, may prevent general peritonitis. In a similar manner it may prevent the perforation of an ulcerating malignant growth, or of a gastric ulcer, or the death of a damaged portion of bowel, or the perforation of a suppurating gall-bladder. When it is found covering and closely enveloping an ovarian cyst or a fibroid tumour of the uterus, even though not adherent, it is safe to assume that something wrong will be found in the tumour. Its effective mobility is shown by the fact that whether the lesion be in the

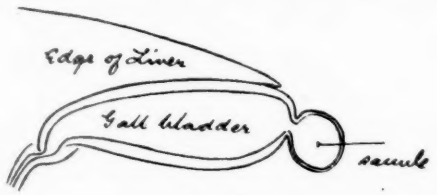


Fig. 17.

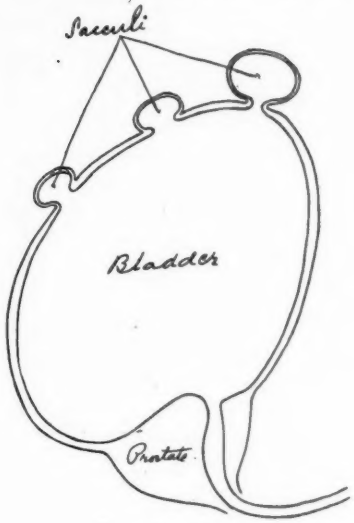


Fig. 18.

diaphragmatic roof of the abdomen, or on the floor of the pelvis, there the omentum can and does find its way.

TORSIONS

Twists are common to nearly all of the abdominal viscera. The intestine (volvulus), stomach, gall-bladder, appendix, kidney, spleen, omentum, ovaries, Fallopian tubes, uterus (pregnant and fibroid), and testes are each liable to such accident.

The sudden attack, the mystery of its onset, the associated dangers and pain, and the amenability of the condition to surgical treatment have made this subject one of special interest.

Whatever organ the twist involves, and whether viewed in reference to etiology, pathology, symptoms, diagnosis, prognosis, or treatment, all cases have many points in common.

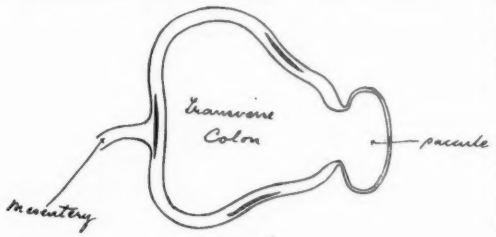


Fig. 19.

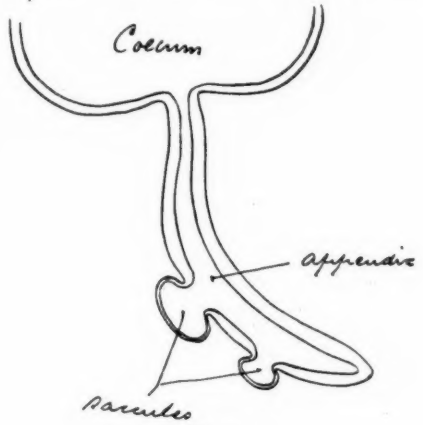


Fig. 20.

In order to twist, the organ must have a pedicle, congenital or acquired, and the longer the better. It must have space to turn in and a shape which will allow of rotation. No other movable body answers to these requirements as does an ovarian tumour, and so accordingly the majority of torsions are associated with ovarian tumours.

The presence of a second ovarian tumour or of a pregnant uterus predisposes to twisting, so does the fact that the tumour is a dermoid. The probable explanation is that one swelling helps to roll the other over, and that dermoid tumours, being lighter than ordinary ovarian tumours, are more easily rotated.

The causes of torsion have been largely discussed, but there is little real knowledge of them. Chronic constipation, congenital or acquired defects in attachment, and in the case of ovarian cysts alternate distension and collapse of the sigmoid flexure and urinary bladder, movements of the abdominal wall, and peristaltic movements of the intestines have been specially mentioned. It is possible that in some cases the omentum, recognizing the tumor as an intruder, tries to hustle it and thus starts the twist.

In the great majority of cases the twist is from left to right. The reason for this has been widely disputed, but it has apparently been forgotten that a left to right twist is an inherent physiological trait which reveals itself amongst other instances in the heart's beat, in the

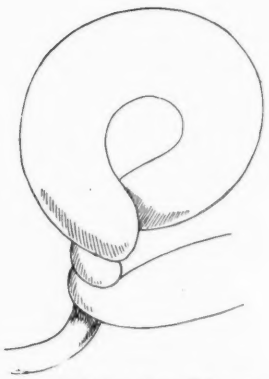


Fig. 21. Volvulus of small intestine.

development of the gastro-intestinal tract, and in the contractions of the uterus during labour.

The pathological changes that occur in connection with twists are in all cases similar, and are due to interference with the local circulation. If recognized early, the twist can be undone. Later changes, due to inflammation and matting of the surrounding tissues, may obscure the cause of the condition.

The first change is an engorgement of the veins of the organ twisted, with an effusion of blood-stained serum, into the peritoneal cavity, or into the tunica vaginalis if the case is testicular. Then follow extravasation of blood into the affected organ, total arrest of the circulation, and gangrene. Afterwards the dead tissue acts as a foreign body and peritonitis ensues. Organisms from the surrounding intestines penetrate the dead or dying tissues, and an abdominal abscess results. Or, in the case of small ovarian cysts and those damaged gradually by a series of twists, a new circulation can be established through new vessels formed in omental adhesions, and following on such a history an ovarian tumour may then be found growing in and from the omentum. More rarely still entire absorption of the gangrenous mass may take place. Death is, however, the usual and expected result.

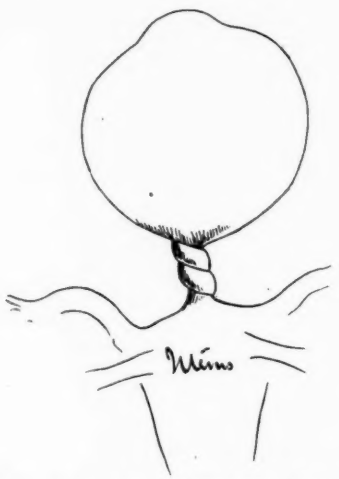


Fig. 23. Volvulus of subperitoneal fibroid.

In all cases the attack commences suddenly with severe pain increasing steadily in intensity, and accompanied by vomiting, by the symptoms of collapse, and by suggestive tenderness to pressure over the involved organ. Then

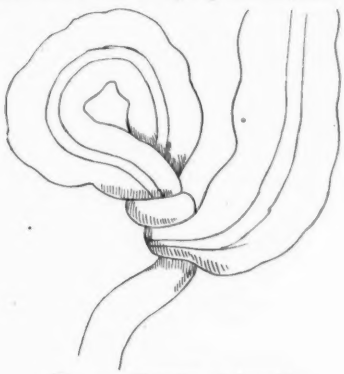


Fig. 22. Volvulus of sigmoid.

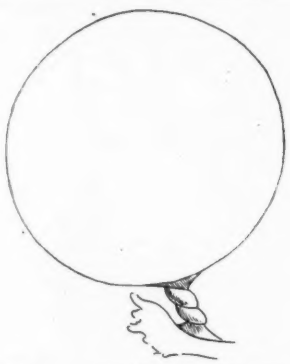


Fig. 24. Volvulus of ovarian cyst.

peritonitis may follow. In all cases the attack may steadily progress to a fatal issue, and in well-pronounced instances this is the rule. The majority, however, give a history of one or many previous attacks, which have either been recovered from very rapidly, or else somewhat slowly. In the former the twist had become undone, and of this we have obtained overwhelming evidence. In the latter the effects had passed off, but a permanent twist remained.

Bowel and ovarian cases in which several twists had occurred have come under our notice, and in these the last attack had been preceded by many of a similar character. It was clear that though several old-standing twists were present, the last was *the* cause of serious mischief. No dangerous result may follow even five or six twists, the result depends on the effect on the local circulation. Half a twist with a short broad pedicle may be more serious in its results than half a dozen when the pedicle is long and narrow.

The diagnosis in this, as in all other abdominal emergencies, has to be made between ruptured gastric or duodenal ulcer, appendix perforation, gallstones, intestinal obstruction, ectopic gestation, and other causes of peritonitis.

The treatment of all internal twists is the same, viz., by operation as early as possible.

For the illustrations I am indebted to Dr. G. W. Richardson, F. R. C. S.

ON THE RELATIONS BETWEEN THE OVARIES AND THE UTERUS

By DR. FRANS DAELS
Assistant at the University of Gent, Belgium
(From the Experimental-Biological Department of the Pathologic Institute, University of Berlin)

THE researches of Strassmann, Halban, and L. Fraenkel on the relations between the ovaries and the uterus may be considered the most important experimental works on this subject. Strassmann (1) wished to prove experimentally that the menstrual alterations of the uterine mucous membrane were excited by ovulation. The starting point of his experiments was the question whether the principle of Pflüger's hypothesis could be thus demonstrated. For a test animal he chose the female dog. Although rut and menstruation differ in some details, they are in the main identical; there is no essential difference in their external and internal phenomena. The experiments reported by Strassmann show that an increase of the intra-ovarial pressure in the dog by injecting a fluid into the ovaries causes alterations in the endometrium. These are accompanied by phenomena in the genitalia resembling in many respects those of rut. The stimulations issuing from the ovaries are probably collected in the nerves and ganglia and transmitted; thus from those organs the alterations of the uterine mucous membrane are brought about. Strassmann says: "The continual stimulation, caused by the injected masses, brings about a continual vascular excitement of the tracts supplying the uterus." The stimulation in the ovaries produces therefore a reflexive hyperemia of the uterus whereby rut, that is, menstruation, is supposed to be produced. This idea is distinctly pronounced by Strassmann in these words: "The pressure of the growing follicle upon the sensory nerve terminations of the ovary acts by reflexes upon the vasomotor nerves of the genitalia."

According to our opinion the phenomena observed by Strassmann may likewise be regarded and explained as a sign or consequence of this hyperemia. It is not unusual that stimulation in the area of the genitalia produces uterine hyperemia. We injected in three dogs, into the peripheral end of one horn of the uterus, after having applied a peripheral ligature, one drop of tincture of iodine. In two dogs we observed the following day and during 3 to 4 days a distinct hyperemia of the vagina, a redness of the clitoris and an increased secretion of mucus; at the same time the animals were constantly persecuted by the male

dogs. In the dissection on the sixth day we did not find the characteristic phenomena of rut, that is, the macroscopically visible swelling of the uterine horns with the changing of their flat form into a more round shape, but found only a stong hyperemia produced by the irritation in the area of the genitalia. We consider it, however, not at all demonstrated, that such a hyperemia brings about rut or menstruation.

Moreover Pflüger's hypothesis with Strassmann's experimental support was entirely contradicted by the results of Halban (2). After the transplantation of ovaries (subcutaneously, into the muscles, into the omentum) in baboons, menstruation continued in 2 of 4 animals. After the extirpation of the grafted ovary in one animal, menstruation ceased entirely. Consequently Halban explains the process by the secretion of a chemical substance in the ovaries which passes into the blood and then probably exerts through the nerve tracts a specific irritation of the uterine mucous membrane so that the latter undergoes menstrual alterations. Halban therefore does not speak of hyperemia, but of a specific irritation being the cause.

L. Fraenkel (3) attempted to define more precisely the rôle of the ovaries on the basis of his extensive though not reliable experiments, by assuming important functions for the corpus luteum in the production of menstruation. "Menstruation is caused by the secretory action of the corpus luteum. It is not the pressure of the growing follicle upon the ovarial nerves, but the action of the corpus luteum that causes menstruation. That structure causes every four weeks the cyclical hyperemia of the uterus which leads either to pregnancy or to menstruation." We shall further on consider the significance of the corpus luteum more thoroughly. At this point we wish to deal again with the opinion according to which hyperemia is supposed to be the cause of menstruation, producing the various alterations of the genital organs. We reject decidedly this opinion for the following reasons.

Although we had rejected the supposed action of yohimbin on rut and ovulation on the basis of our previous experiments (Experimental Contributions to the Action of Yohimbin on the Female Genitalia, Berl. klin. Woch., No. 42, 1907), new experiments on the mentioned subject with this substance seemed to furnish a more exact information. That yohimbin exerts a hyperemic action on the genitalia was also demonstrated by our results. But it is not at all proven that such a continued hyperemia causes by itself rut, as Loewy (4) and Holterbach (5) claim. We have obtained obvious results by the following experiment:

Three small female dogs of 6,700, 6,900, and 8,800 grams, which had whelped 4 to 5 weeks before and were thus naturally in condition in which rut could not be present, were given several times a day per os a dose of 0.0025 gm. of yohimbinum lacticum Spiegel, a dose quite sufficient according to the researches of Holterbach for the production of rut. The dose was given at the following times:

1st	day	8	10	1	3	5
2d	"	7	9	11	3	5
3d	"	8	10	12	3	6
4th	"	8	10	11	3	6
5th	"	8	10	1	3	6
6th	"	8	10	1	3	
7th	"			11		5
8th	"	8	10	2	4	
9th	"	7	9	11	2	
10th	"	7	9	12	3	6
11th	"	8	10	1	3	5
12th	"	7	10	1	3	6
13th	"				4	6
14th	"		10	12		
15th	"	7	9	11	2	6
16th	"	8	10	1	3	
17th	"	7	10	1	3	5
18th	"	7	9	12	2	6
19th	"	7	10	1	3	5
20th	"	7	9	11	3	
21st	"			11	12	6
22d	"	8	10	2	4	6

By this continual giving of yohimbin per os we undoubtedly produced a continuous hyperemia of the genitalia, as was demonstrated also by the clinical symptoms. On the third day the dog of 6,900 gm. showed a strong mucous discharge; on the fifth day the secreted fluid was hemorrhagic, the genitalia were very soft and hyperemic. In performing laparotomy on this animal after 11 days, we noticed nothing peculiar in the ovaries, but in the horns of the uterus, not showing the macroscopical appearances of rut, were 5 small thickenings. They could be the residuals of the old egg-insertions, yet more likely the signs of a new pregnancy. The hemorrhagic vulvar excretion

continued. The animal was killed and dissected on the 23d day. The five thickenings of the uterine horns had increased; on cross section they did not yet show a distinct macroscopic amniotic membrane. The ovaries showed some very slightly marked corpora lutea. The animal was, therefore, in statu graviditatis. The animal of 6,700 gm. showed after 8 days a pronounced mucous secretion with vulvar hyperemia. It was subjected to laparotomy after 12 days, no distinct alterations being observed in the ovaries or the uterus. In the dissection on the 23d day we found the same macroscopical condition; though the mucosa of the uterus was strongly reddened and showed here and there hemorrhagic spots, there were no real rut phenomena. Just as little was shown by the third animal in which during the whole course and in dissection was found only a hyperemia of the genitalia.

We consider the following conclusion justified: These experiments confirm that yohimbin is able to produce in the pregnant as well as in the non-pregnant uterus a mucous and even hemorrhagic discharge following a hyperemia of the genital organs. A continual hyperemia however (23 days) did not produce rut, and since no fact suggests ascribing to yohimbin the power of restricting rut, we think it is justified to generalize and to presume: The hyperemia is not the starting point of rut nor of menstruation; it is only a part of this symptom-complex, as, for instance, it is also represented in the phenomena of inflammation. The starting point of rut or menstruation in the uterus is, therefore, not of vasomotor origin; there is here a much more extensive specific action.

If we now examine more thoroughly this action we will find facts in opposition to Fraenkel's hypothesis. 1. The assumption that, after rupture of the follicle, the development of the corpus luteum produces menstruation, compels one to assume furthermore that the maturation and rupture of the follicle and menstruation are in a regular causal relation to each other, which would contradict the extensive observations of Leopold (6) and Mironoff (7). 2. As in animals rut continues for weeks, whereas in the human menstruation is completed in 2 to 5 days, we must logically, on the basis of Fraenkel's hypothesis, see the cause of this phenomenon in the fact that in animals several follicles undergo maturation and burst, consequently forming several corpora lutea in succession, thus making the specific action (not only of the vasomotor reflexes) continuous. Now we have in the course of previous experiments (l.c.) observed that after a bilateral ovariectomy in a dog at the beginning of rut, the latter, that is, in this case only the specific alterations in the area of the uterine horns, could continue for weeks. If, therefore, these alterations are dependent upon the ovaries in so much that after their extirpation rut does not occur, yet these alterations are so far independent that, having begun, they are able to continue. The persistence of the alterations is, therefore, certainly not the consequence of an internal secretion of the corpora lutea, since the ovary has been extirpated. 3. The failure of menstruation in women after burning out the corpus luteum, or after preventing the development by destroying the follicle with the cautery, would be an undeniable argument if such a failure would never occur after operations, and if, on the other hand, the burning of another part of the ovary would never have such consequences. Now, as to the former, failures do occur, and the latter has never been tried. Concerning the second objection we know only that the so-called influence of the corpus luteum upon the development of the ovum, demonstrated by the cauterization of the corpora lutea, also appeared in a high degree in Fraenkel's experiments by simply burning a hole in the ovary. We believe the following conclusion is justified: *Even if the theory of Fraenkel is confined to the statement that "the origin of menstruation and of rut is to be ascribed to the specific action of the internal secretion of the corpus luteum", this function of the corpus luteum is, at the present stage of researches, to be regarded as a hypothesis only.*

The corpora lutea have furthermore, according to the theory of Fraenkel, by an internal secretion the "function of causing the insertion of the ovula and of securing their further development." 1. The presumption of the corpora lutea having the function of causing the insertion of the ovum is, in our opinion,

only with difficulty to be brought into concordance with clinical facts. If without pregnancy only a corpus luteum spurium is formed and after conception a corpus luteum verum, this can only be due to an irritation by the fecundated ovum; the latter consequently stands necessarily in connection with the uterus before the impulse for the formation of the corpus luteum verum is given. With the theory of Fraenkel we are compelled, in order to avoid conflicting with facts, to assume that the fecundated ovum produces the formation of the corpus luteum by some influence upon the genitalia, and that the corpus luteum then causes, by an internal secretion, the insertion and the further development of the ovum. Such a process would, however, appear extraordinarily complicated. 2. If Fraenkel cauterizes the corpora lutea, a retrogressive transformation of all ovular chambers occurs. If he, however, only burns a hole into the ovary, outside of the corpora lutea, he observes in one case (xci) a general, in another (xc) a partial, retrogressive transformation. Where is the specific function of the corporea lutea? 3. If Fraenkel claims that after the replacement of the corpora lutea, extirpated from the ovaries, into the abdominal cavity, only a slow retrogressive transformation takes place, in contradistinction to a rapid one, this assumption is not at all justified by the protocols added. In 7 pregnant rabbits he extirpated both ovaries. For one animal (cix) the date of dissection is not noted; therefore no conclusion can be drawn. Three animals were sacrificed after 8, 6, and 5 days (xxix, lvii, cv); retrogressive transformation of all ovula. Two animals, sacrificed after 5 days, show, just as the former, a rapid retrogressive transformation of the ovula. In one animal the replaced corpora lutea had not become adherent, in the other one had only replaced ovarial tissue without corpora lutea. Finally in one animal (cvii), sacrificed after 3 days, in which the replaced corpora lutea were adherent, signs of a slow retrogressive transformation were observed. We seek in vain for the elements necessary for comparison.

Since this question of the significance and the function of the corpus luteum appeared to be of great importance from a gynecologic standpoint (compare, for instance, the conditions in cystic mole and chorionepithelioma) we have made a series of new experiments on this subject. Although as yet they are incomplete, we report here the first results, because they appear to furnish a support to the above explanations.

As Fraenkel in his experiments with ovariectomy had obtained suppuration and adhesions in the great majority of his cases, consequently impairing his conclusions dealing only with the fact of ovariectomy, we sought a more simple and less objectionable method and prefer that of ovariectomy from the back in guinea-pigs. Test experiments soon showed us that it is possible in this way to remove the ovaries very much quicker and with less danger. After having shaved a small area of the skin on the dorsum of the animal and disinfected it with soap and alcohol, we make a median incision of about one-fourth inch from the inferior end of the thorax. Then we pull one skin margin aside and push two blunt needles through the abdominal muscles, one-third inch from the median line and about 5 mm. below the costal margin. We thus produce, by separating the needles, an opening exposing the parametral fatty tissue. After seizing the latter with the forceps, it is brought to the surface by slow and uniform traction. Soon the tube and ovary appear; the latter is ligated, cut off, and the stump replaced. The same is done on the other side. Then the skin is simply shoved over the muscle wound and the margins sutured, without including the muscle. The area is covered by collodium. As a rule the operation is perfectly uncomplicated, and healing is excellent. The adhesions produced in the abdominal cavity are practically insignificant since the horn of the uterus is only at its upper end in communication with the point of ligature in the ovary; in dissection the latter is often found entirely movable. If the parametral fatty tissue cannot fill out the produced space, one can go carefully with a forceps, of course not a surgical forceps, into the depth; it is then usually possible to catch the parts. For the regular course of the operation a light narcosis, we use ether, is necessary. We have explained all the details of our method on account of its being a rapid, simple, and with

some asepsis quite safe method of ovariectomy. Just in this line experimental gynecology needs still to furnish many results.

As the first point we tried to determine the influence of bilateral ovariectomy on the pregnant animal.

No. 1. In the second to fourth weeks of pregnancy; bilateral ovariectomy. Dissected after 7 days; small local thickenings of the uterine wall.

No. 2. In the second to fourth week of pregnancy; bilateral ovariectomy. Dissected after 8 days; only small local thickenings.

No. 3. Idem.

No. 4. Idem.

No. 5. In the third to fourth week of pregnancy; bilateral ovariectomy. Dissected after 10 days; only small local thickenings of the uterine wall.

No. 6. Idem.

No. 7. Idem.

No. 8. In the third to fourth week of pregnancy; bilateral ovariectomy. Dissected after 11 days; only local thickenings.

No. 9. Idem.

That this series of animals were pregnant at the time of operation is confirmed by —

1. The animal was put to the buck immediately after whelping.

2. In most animals the ovula could be distinctly felt.

3. The ovaries showed pronounced corpora lutea.

4. The local thickenings with small hemorrhagic spots in the uterine wall and on the uterine mucous membrane found in dissection represent an extraordinary finding. The local thickening exists during some days after normal whelping instead of the former ovular insertions.

No. 10. In the fourth to fifth week of pregnancy; bilateral ovariectomy. Dissected after 12 days; in the left horn of the uterus a dirty, thick, brown fluid, in the right two fairly dry and solid corpora of 8-10 mm. length. No embryonal form to be recognized. Large yellow spots indicate the high fat content. These bodies are connected with the uterine wall by a thin membrane.

In addition we made experiments on animals known to be more resistant, namely, white rats.

No. 11. White rat surely pregnant for 8 to 12 days; bilateral ovariectomy. Dissection after 13 days. Horns of the uterus quite normal.

No. 12. Idem.

No. 13. White rat in fifteenth to twentieth day of pregnancy. (Pregnancy lasts in the rat 4 weeks, in the guinea-pig 9 weeks.) Bilateral ovariectomy. Dissected after 10 days; horns of uterus normal. Remarks: After 3 days was noticed a hemorrhagic discharge from the vagina.

On the basis of the above described 13 experiments we believe to be authorized the following conclusions:

Bilateral ovariectomy in the pregnant animal always interrupts pregnancy during more than the first half of its duration. Nos. 13 and 10 (left horn) indicate an abortion, which may also have occurred in several of the other animals. No. 10 showed at the same time a real retrogressive transformation of the ovula, as Fraenkel, in our opinion incorrectly, assumes for all of his cases, even those where ovular cavities the size of a walnut had totally disappeared within 5 days (cv).

Several different factors can contribute to an interruption of pregnancy, and we also made experiments in this direction.

No. 14. Pregnant guinea-pig, third to fourth week. The operation was performed in the same way but instead of the ovaries large portions of the parametrium and of the mesentery were ligated and cut off. Sacrificed after 12 days; the horns of the uterus are severely hydrosalpingitic and swollen. On one side are three, on the other one embryo in copious amniotic fluid and well preserved.

No. 15. Third to fourth week of pregnancy. On the one side the ovary was extirpated, on the other the parametrium ligated, the ovary left. Sacrificed after 11 days; in one horn of the uterus a well-preserved embryo 7 to 9 mm. in length. In the other, on the side the ovary remained and in which several corpora lutea are found, there exists a degenerated mass of tissue 5 mm. in length with yellow spots; no embryo to be recognized.

No. 16. Second to fourth week of pregnancy. Bilateral ligature of broad portions of the mesentery and mesometrium. Died in three days of peritonitis. Neither ovary had been ligated. Two quite empty fetal chambers; no embryo to be recognized.

No. 17. Second to fourth week of pregnancy. Unilateral ovariectomy. Sacrificed after 7 days. In the remaining ovary three perfect corpora lutea. In the horn of the uterus of the same side three thickenings of the uterine wall with hemorrhagic spots, as we had found in the other retrogressive transformations.

No. 18. Pregnant guinea-pig, third to fourth week. Unilateral ovariectomy; on the other side the parametral tissue was simply drawn through the incision and replaced. Dissection after 4 days; at the remaining ovary a well-developed corpus luteum. In one horn of the uterus one, in the other 4 strong local thickenings of the uterine wall, without a trace of fetal residue.

Conclusion. If experiments 14 and 15 speak for the influence of the absence of the ovary and for the rôle of the internal secretion of that organ, so experiments 16, 17, and 18 suggest care in a generalization of the explanation, and experiments 15, 17, and 18 advocate distinctly the assumption of a specific function of the corpus luteum. It would not be surprising if only the trauma of ligating and extirpation of both ovaries should be sufficient always to cause the interruption of pregnancy.

The corpus luteum being regarded the secreting tissue, important for menstruation and the development of the ovum, L. Fraenkel has used the copious administration of this tissue for combatting the complaints of amenorrhea and the menopause. If the rôle of the internal secretion of the corpus luteum is a fact and if, as Fraenkel asserts, the internal administration is effective, it appears to us somewhat strange that one should combat with this substance secondary symptoms only, without being able to influence the chief process to which these symptoms are due, that is, menstruation itself. If the internal administration be effective, the copious ingestion of this substance by the pregnant animal which has undergone ovariectomy should show a distinct influence. To test this we added to the food of pregnant animals, after ovariectomy, ground lutein tablets, so that on the average each animal received 1.5 tablet daily, corresponding perhaps to 20 to 50 times the lutein tissue contained in its ovaries.

No. 19. Guinea-pig in about the seventh week of pregnancy; bilateral ovariectomy; lutein. Dissected after 4 days; horns of the uterus contracted, the placenta forms on the external surface prominent sinuses. In the oval chambers 4 embryos 4 to 4.5 mm. long, two sanguinolent with hemorrhage in the cutis; in the two others the process beginning. The fetuses were therefore surely dead.

No. 20. Highly pregnant, sixth to seventh week; bilateral ovariectomy, lutein. Dissected after 3 days; one horn of the uterus strongly thickened, in the other two ovular chambers, the external one empty with a preserved large placenta, the upper one containing an embryo 3.5 to 4 mm. long. The animal was therefore certainly about to abort.

No. 21. Pregnant, third to fourth week; bilateral ovariectomy, lutein. Dissected after 4 days; horns of the uterus of a normal shape. At one horn hangs quite laterally yet still in the lumen a soft mass of tissue, 5 to 6 mm. broad. Nothing distinctly recognizable.

Nos. 22, 23, 24, 25, 26, pregnant animals in the third to fourth week; bilateral ovariectomy, lutein. Dissected after 7 days; in 24 and 26 the uterine wall on both sides is distinctly swollen, in 22 unilaterally a small thickening; in 23 and 25 nothing abnormal to be recognized.

After these experiments with lutein tissue regarded as the only active substance in the ovary, we made for comparison similar experiments but instead of lutein employed tablets of oophorin. We therefore gave the animals in these tablets the whole ovarial tissue, adding thus undoubtedly a large quantity of inactive tissue. For producing a distinct influence the conditions were therefore far more unfavorable.

Nos. 27, 28, 29, 30. Pregnant guinea-pigs, third to fourth week; bilateral ovariectomy, 1.5 tablets of oophorin per animal each day. Dissected after 8 days. 28, horns of the uterus not distinctly visible. 29, in the horns of the uterus 4 small, about 5 mm. long, solid bodies, one with a yellowish appearance. 27, the horns of the uterus contain two bodies, similar to the former. 30, just about to abort. One horn of the uterus contains a thick, brown fluid only, the other two bodies 5 mm. long, lying loosely in the horns of the uterus, a similar one in the vagina.

If it is allowable to assume from these internal administrations an influence retarding retrogressive transformation, it must be ascribed to the oophorin. These experiments will be continued.

Reviewing briefly the opinions advanced in this report on the basis of our results we say: An irritation in the area of the genitalia may produce a hyperemia of the uterus; this hyperemia is, however, to be distinguished thoroughly from rut or menstruation. Hyperemia is only one of the symptoms of rut or menstruation without possessing in this direction any causal significance. For the production of rut or menstruation therefore the ovaries do not act by the production of hyperemia of the uterus but by a specific influence, the latter being necessary for the beginning only of the phenomenon, not for its further development. In the present stage of researches the role ascribed to the corpus luteum for the excitement of rut or menstruation is to be regarded as a hypothesis only. In the pregnant guinea-pig and rat bilateral ovariectomy interrupts pregnancy in more than the first

half of its duration. To cause this interruption, however, several factors work together (against Fraenkel), to which our experiments undoubtedly point without, it is true, defining them more precisely. The internal administration of lutein after ovariectomy does not exert the slightest influence toward preserving pregnancy. At present we can say little of the effect of oophorin. *At present the hypothesis of the specific function of the corpus luteum with regard to the imbedding and development of the ovum must be considered as being in disagreement with certain distinct clinical and experimental observations.*

But we dare to go one step further. For the above-mentioned reasons we do not regard the corpus luteum important for the insertion and the development of the ovum. Consequently we are not allowed to ascribe the greater development of the corpus luteum verum, sive graviditatis, in proportion to the spurium, sive menstruationis, to the hyperemia of pregnancy. For if this were an effect of hyperemia, the corpus luteum ought to have developed very strongly in our experiment with yohimbin on the pregnant dog, as the corpus luteum then should develop up to the end of pregnancy.

In a few words we wish to explain our conception of the significance of the corpus luteum verum. When in the insertion and development of the ovum the organism is compelled to restrain the embryonal proliferation of the chorion, it is in a condition in which the cells of the follicle epithelium (which by their origin and evolution have preserved more similarity to embryonal cells than the usual body-cell) are able to proliferate extraordinarily. Very soon, however, in the third or fourth month of pregnancy, the exochorion shows a diminution in its capacity for proliferation and even undergoes a certain atrophy (disappearance of the syncytium). Then likewise the development of the corpus luteum verum ceases. There are thus, according to our opinion, parallel phenomena dependent upon the same general condition. Thus also in cystic mole the hyperplasia of the lutein cells would not be the cause (Pick, 8; Jaffé, 9), or the consequence (Dunger, 10) of the formation of the mole, but the synchronous expression of a general pathologic condition which at present is not known.

REFERENCES.

1. Strassmann. Beiträge zur Lehre von der Ovulation, Menstruation u. Conception. Arch. für Gynäkologie., bd. 52.
2. Halban. Ovarium und Menstruation. Verh. d. deutschen Gesellschaft f. Gynäkol., ix, 1901.
3. Fraenkel, L. Die Funktion des Corpus Luteum. Arch. f. Gynäk., bd. 68, 1903.
4. Loewy, A. Therapie der Gegenwart, Juli, 1901.
5. Holterbach. Deutsche Tierärztliche Wochenschrift., xv, 13 u. 14.
6. Leopold. Untersuchengen über Menstruation und Ovulation. Arch. f. Gynäk., bd. xxi, 1883.
7. Leopold und Mironoff. Beitrag zur Lehre von der Ovulation und Menstruation, Arch. f. Gynäk, bd. 45, 1894.
8. Pick, L. Zur Frage der Eierstocksver änd. bei der Blasenmole. Zentralbl. f. Gynäk., No. 34, p. 1,083, 1903.
9. Jaffé. Blasenmole und Eierstock. Arch. f. Gynäk., bd. 70, heft 3.
10. Dunger. Chorionepithelioma und Blasenmole. Beiträge f. Path. Anatomie u. fur allg. Pathologie, bd. 37, 1904.

A CONSERVATIVE TREATMENT OF SARCOMA

By W. WAYNE BABCOCK, M. D.,
Surgeon to the Samaritan Hospital,

AND

GEORGE E. PFAHLER, M. D.,
Roentgenologist to the Medico-Chirurgical Hospital, Philadelphia

SUMMARY

SARCOMAS fall into two clinical classes: (*a*) those relatively benign, comprising the majority of the central sarcomas of long bones, the myelomas, giant-celled sarcomas, and certain fibro-sarcomas, which may be eradicated by simple resection, enucleation, or, at times, even by curettement; and (*b*) those very malignant, including the periosteal sarcomas of long bones, the melanotic, small round-celled and neuro-sarcomas, which almost invariably lead to death within a few years after their appearance, despite the most thorough excision, resection, or amputation known to surgery.

2. Early and more radical operative measures of great value in combating carcinoma have increased the early mortality and have not clearly decreased the tendency to recurrence and metastasis in sarcoma.

3. High amputation, usually unnecessary, and unjustifiable for the more benign sarcomas, usually is unavailing against the more malignant.

4. Of the very malignant tumors, sarcomas are most prone to spontaneous disappearance, or to retrogression after X-ray treatment, the injections of certain toxins, or after pyogenic infections; on the other hand, they are least amenable to radical operative treatment.

5. Traumatism is the most powerful localizing agent for the primary growth in sarcoma; operative traumatism the most powerful localizing agent for the recurrent growth; in other words, excise, resect, or amputate where you will, the return of the sarcoma usually will be in the scar.

As a corollary:—

6. Operative traumatism should, as far as possible, be limited to the field of the sarcoma, so that recurrence may not be invited to a new or distant point.

7. The life and growth of the primary sarcoma rarely directly cause cachexia or a fatal issue, the death and decomposition of the tumor-cells are the most potent factors in the production of cachexia and a frequent cause of death of the patient. The duration of life, therefore, is often measured by one's ability to combat necrotic processes in the tumor.

8. Pending the development of better therapeutic agents, the combination of (*a*) judicious subcapsular enucleation, (*b*) massive and prolonged Roentgenism, (*c*) the topical employment of methylene blue or pyoktanin, and (*d*) occasionally the internal administration of certain drugs and toxins is commended as offering results in the treatment of the very malignant or recurrent types of sarcoma superior to those obtained by the most extensive and desperate surgical eradication.

THE FUTILITY OF AMPUTATION

It is difficult to prove the beneficence of amputation for sarcoma. From a lack of careful microscopic study a relatively benign myeloma, a giant-celled sarcoma, a central sarcoma of long bones, or a chondroma may be classed with the very malignant periosteal tumors, and the freedom from recurrence in such a case may be cited as proof of the value of the amputation. Thus, of 68 cases of amputation for periosteal sarcoma of the femur collected by Butlin only one patient was known to be alive three years from the time of operation, and in this case there was doubt as to the periosteal origin of the tumor. Of Butlin's 18 cases of periosteal sarcoma of the humerus treated by amputation, 2 cases of possible cure occurred in patients regarding whom there was a doubtful diagnosis. Again, the patient may recover despite instead of because of the operation. Of Wyeth's 5 cases of disarticulation at the hip-joint for

sarcoma 4 died in from six to twelve months after the operation from return of the disease. The fifth case was least favorable, the disease having already invaded the acetabulum which was curetted at the time of the operation, but free excision of the diseased area was not made. A severe pyogenic infection developed in the wound after the operation, and as the amputation could not be classed as a radical extirpation of the sarcoma it seems probable that the infection rather than the operation is to be credited with the apparent cure in this case. Similarly, after 6 disarticulations of the hip-joint done by Coley for periosteal sarcoma none was known to be alive eighteen months from the time of operation. A seventh patient refused amputation and was treated by X-rays, the injection of mixed toxins, drainage, and curettage, and yet despite the occurrence of two large metastatic growths in the trunk, the man was apparently well five years after the operation. Again, in 2 other cases of apparent sarcomas of long bone, seen by Coley, operation was refused and the patients passed into the hands of non-professionals who administered herb teas. In both of these cases the sarcomas disappeared. It is, therefore, evident that the benignancy of the particular tumor, the influence of various pyogenic infections, and the tendency for spontaneous disappearance occasionally noted in sarcoma must be excluded, before we can positively attribute a cure to the operative procedure. It is less difficult to find evidence that operative treatment is distinctly harmful. Wyeth's statistics show a primary mortality of about 11 per cent from the bloodless method of disarticulation at the hip-joint for sarcoma. Morel's statistics show no mortality when the modern interscapulo-thoracic amputation of Berger is done for benign growths (10 cases); a mortality of 3.12 per cent when it is performed for sarcoma of the humerus (64 cases); and an operative mortality of 25 per cent when performed for sarcoma of the scapula (20 cases). After this extensive operation for sarcoma of the humerus about one half of the patients soon show generalization or recurrence of the growth, with an average longevity of nineteen or twenty months. Of the 75 per cent who survive the operation for sarcoma of the scapula over two thirds die of recurrence or metastatic growths, with an average duration of life of only thirteen months. Permanent cures from operation for sarcoma of the humerus, proven to be periosteal and not central or myeloid, are almost unknown.

THE INCIDENCE TO ACCIDENTAL AND OPERATIVE TRAUMATISM

Prolonged or frequently repeated irritations favor the development of carcinomas; abrupt violent injury that of sarcoma. Thus the prolonged irritation of a clay pipe, a carious tooth, gall-stones, inveterate or protracted ulceration, eczematous inflammation, irritating cicatrization, or the friction of paraffin or soot impregnated clothing often precedes the development of carcinoma. A severe contusion, a crushing injury, or a fracture seems often clearly to predispose to sarcoma. In our series one patient in stooping struck her head violently against a table, and within two months there developed an enlargement from a sarcoma of the frontal bone. A second case, a robust young man, was thrown violently against a car seat, bruising the testicle; within a week the organ was nearly twice the normal size from sarcomatous change. A third patient had a heavy fall upon the shoulder, and the pain of the injury merged into that from a rapidly growing sarcoma of the upper end of the humerus. In a fourth case there was severe pain in the leg following the strain from a misstep, which continued until the leg was amputated for sarcoma of the popliteal space about eight months later. In a fifth case a physician in taking apart a bedstead hit himself a violent blow under the jaw, and one month later a melanotic sarcoma had developed in the region of the injury. A sixth case was that of a little girl who was struck by a stick over the left side of the jaw, and one month later a round-celled sarcoma was palpable on the mandible. The seventh patient accidentally struck his knee, and within four weeks a rapidly growing sarcoma of the lower end of the femur was noted. An eighth case was that of an elderly woman who developed melanotic sarcomas of the ankle following the irritation of an ill-fitting shoe. Two similar

cases in which the foot was irritated by projecting nails in the shoe are recorded by Bland-Sutton. In about one third of the cases of sarcoma the history shows a suggestive relationship to some form of traumatism. If it be admitted that traumatism is a powerful determining or localizing factor in the development of a primary sarcoma, an association between later traumatisms and recurrences or secondary growths may reasonably be expected. Of special importance is the relationship between operative traumatism, which is the most constant and severe type of injury patients with sarcoma endure, to the recurrent growths. Strangely enough, the fact that recidivity usually takes place in the operative scar seems to have attracted little or no attention. Apparently it makes little difference where the scar is placed, for if amputation be done at the knee, the tumor returns in the stump; if at the hip, the tumor returns about the cicatrix. In one patient, observed by a confrere, after an amputation at the elbow for sarcoma of the wrist the tumor returned in the elbow stump; disarticulation was then done at the shoulder-joint, and the sarcoma recurred in the shoulder; whereupon an interscapulo-thoracic amputation was performed which was followed by a rapid recurrence in the wall of the thorax adjacent to the scar. A second patient had an inoperable sarcoma of the orbit and apparently entirely recovered under X-ray treatment. Some time later a rhinologist resected an enlarged turbinate. This slight operation was promptly followed by a recurrence *not in the orbit, but in the nose*, the tumor progressing rapidly to the death of the patient. The time-worn observation that slight operations for warts or moles may induce rapidly progressive sarcomatous changes seems to be founded upon more than a mere coincidence. It may be evident that we consider the essential cause of sarcoma as being diffused through the body prior to the development of the local lesion. A child falls upon the back and develops Pott's disease, involving the body of a certain dorsal vertebræ; a youth is struck on the thigh and develops a sarcoma of the femur. It is as logical to consider that the tubercle bacilli originated in the vertebral body in the first case as to consider that the essential cause of sarcoma originated in the femur in the second. Altogether we feel justified in asserting that traumatism is the most powerful known predisposing factor for the primary growth in sarcoma and that operative traumatism is the most potent factor in determining the site of recidivity.

INDICATIONS FOR CONSERVATIVE TREATMENT IN SARCOMA

Amputations are demanded for the removal of limbs, disorganized or rendered functionally useless by the presence of malignant growths. Amputations are not indicated for sarcomas of the extremities that have not rendered the part incapable of function, unless there be a fair promise of greater longevity and increased comfort after such operation. As against amputation there is the immediate high mortality, the mutilation, incapacity, and the mental distress. If equal comfort and longevity are possible under conservative measures, these are clearly indicated. For periosteal sarcoma of the femur, for example, if under conservative treatment 90 per cent of the patients show an average duration of life of 12 to 18 months with a fair degree of personal comfort, and 10 per cent of the patients live for a longer period of time, this is distinctly preferable to having an immediate mortality of 11 per cent for disarticulation of the hip-joint and no greater average longevity to recompense the patient for the operative agony. Occasionally a patient, after disarticulation of the hip-joint for sarcoma, remains free from recurrence for three or four years, yet to obtain this occasional result it must be considered that eleven patients out of one hundred must be immediately sacrificed, and that over eighty out of every hundred will be subjected unavailingly to one of the most formidable and mutilating operations known to surgery. Moreover, as shown by Mikulicz and his followers, the ultimate results following excision or resection of bone for sarcoma are superior to those obtained by amputation. Likewise, for the extensive sarcomas involving the walls of the thorax, the pelvic bones, the maxillary antrum, and other situations where there is a high immediate mortality with but slight chance of complete eradication from the radical operation; conservative treatment,

even though offering but little in the way of a permanent cure, if it presents any hope of prolonging life or increasing comfort, is carefully to be considered. In any case, however, the decision as to type of treatment should be determined by the patient or his friends after the average results obtained by different measures have been explained. For recurrent sarcomas the outlook is much graver, and it is for these cases especially that we would urge the further trial of a conservative form of treatment. Personally we are impressed by the thought that the less radical treatment is best for nearly all forms of sarcoma, but here opinion should be reinforced by larger experience.

METHOD OF TREATMENT

The measures that have been employed against malignant tumors include operative removal, the local use of radiant energy, topical applications or injections of chemicals, the internal administration of certain drugs and toxins, and a general roborant regime. The method of treatment that we would here advocate consists of certain of the milder surgical measures combined with a more persistent and thorough use of X-ray treatment than usually is given; certain topical applications and the administration of certain inhibitory agents. None of these measures are new, the combination and method of application of these generally known principles are the novel features of the treatment.

I. THE FIELD OF SURGERY

We have indicated that operative treatment favors recidivity. It is likewise probable that metastases to internal organs, if they be not favored, at least are not prevented by operative invasion. Two other factors, however, menace the life of the patient, and against these surgery is most valuable. First, the tumor by its size or pressure may interfere with important functions, and second, and more common, the tumor in its growth exceeds its blood supply and undergoes necrosis and decomposition, so that quantities of dead and decomposing cells lie in the vascular absorptive area of the living part of the tumor. Then it is that quantities of septic and saprophytic products are absorbed into the body, profuse and recurrent hemorrhages often follow, and the patient falls into a condition of progressive toxemia and cachexia which not infrequently is fatal. That the cachexia of sarcoma comes more from the death and decomposition of the tumor-cells rather than from their life and metabolic activities is indicated by the results of surgical enucleation in these cases. If the capsule of the sarcoma be opened and the necrotic tumor enucleated, then for a time the cachexia usually decreases, the patient gains in weight and in the sense of well-being. If a sarcoma grows beyond the absorptive or expulsive capacity of the organism no matter what the form of treatment, then timely surgical interference is desirable, just as it is in certain massive tertiary syphilitic lesions. The indications for surgical intervention are massive size, pressure symptoms, toxemia, cachexia, and severe local hemorrhages. Usually the preferred surgical measure is what we have described as subcapsular enucleation. This is based upon the fact that, contrary to the prevalent opinion, sarcomas are not infiltrative, but are circumscribed and well encapsulated growths. Even with large growths local infiltrative anesthesia will often suffice. An incision is made down to the capsule of the tumor, and each capsule is in turn incised and its contents evacuated. Usually this may best be accomplished by the finger or hand passed close to the inner surface of the capsule, separating the soft tumor mass from its envelope. In this way from a few ounces to many pounds of tumor may be enucleated within a few minutes. The operation should be done rapidly, to limit the amount of hemorrhage, and violence in the manipulations should be avoided. The adjacent tissue planes should not be opened, and the incision through the overlying skin should be merely large enough to permit access to the capsule of the tumor.

II. TOPICAL APPLICATIONS

After the subcapsular enucleation the capsules are wiped out with dry gauze and immediately painted by the following solution:

Pyoktanin	5 parts
Phenol	1 part
Alcohol	20 parts
Water to make	100 parts

Usually packing of the cavities by sterile gauze is desirable to limit the oozing. Iodoform and other substances that interfere with the action of the X-rays should be avoided. The profuse hemorrhages from a necrotic ulcerated sarcoma are best controlled by binding over the denuded surface cotton compresses wrung out of turpentine. Ordinary gauze compresses may fail to check the profuse oozing.

For putrid decomposition in areas of moderate size local applications without subcapsular enucleation may suffice. If the area be small, the application of pure phenol followed by alcohol and then by the pyoktanin solution may be used, this treatment being repeated daily until the odor is overcome. For larger masses of decomposing tumor more powerful agents are required; the fungus ulcer is cleansed and the cavity packed or thickly dusted with ethylate of sodium; or a compress wrung out of a 33 per cent solution of chloride of zinc is introduced into the cavity. After the larger masses of putrescent tissue are thus destroyed the application of carbolic acid, alcohol and pyoktanin may be resumed. In any case odorous decomposition should not be permitted to continue. For superficial necrosis applications of a 2 per cent solution of picric acid are often valuable in preventing putrescence. Instead of pyoktanin, methylene blue may be used. These anilin colors are not only antiseptic and deodorant, they have a storage capacity for fluorescence and so become especially valuable during the employment of the X-rays. Moreover, there is experimental evidence that such photodynamic substances have a powerful destructive action upon certain bacterial toxins and other poisons.

ROENTGENISM

The most potent single agent known against sarcomatous growth is probably the X-ray. The X-rays have a destructive effect upon all living tissue-cells, but the action is especially pronounced against lymphoid and young connective tissue-cells. Thus, the type of embryonic connective tissue of which sarcoma is composed is especially vulnerable. The rays, moreover, increase the amount of fibro-connective tissue in the area treated and thereby tend to produce a denser encapsulation of the growth and to cause obliteration of adjacent lymphatic channels. There is no reason to believe that Roentgen treatment increases the tendency to metastases. The technique must vary with the patient and the character and depth of the tumor. In general, for the treatment of deep-seated tumors the anode should be about thirty centimeters from the skin; the time of exposure should average from twenty to fifty minutes, the application being divided between two different areas; the object being to have the rays during the course of treatment enter the tumor from every possible direction. Neglect of this point increases the jeopardy to the skin, and decreases the desired action upon the tumor. An old high vacuum tube will usually give the best results, except where a superficial lesion is present, when a lower and softer tube should be employed. In general the quality of rays measuring 6 to 8 upon the Benoist scale will give the best results. As to the amount of current, the measurement of that passing through the primary coil is of little value, but the amount passing through the tube as measured by milliampèremeter is important. Usually one ma. is employed, as it is found difficult to use a greater current and keep the vacuum uniform. In the protection of the skin, the variation in the direction of the rays, the distance of the tube from the skin, and the degree of vacuum as previously mentioned are all important. The use of the Pfahler filter, consisting of a diaphragm of sole leather interposed between the tube and the skin, has also been found to be of much value in protecting the skin. The treatment should be given daily for months, or until the irritation of the skin or the disappearance of the neoplasm suggests the desirability of less frequent exposures. After apparent cure the patient should not relinquish treatment, but should be treated once every two to eight weeks until several years have elapsed. At the outset the patient should be advised regarding the necessity for continued treatment, just as a patient with syphilis is advised; that is, that the lesions may largely disappear within a few months, but the tendency for recurrence may only be overcome by occasional treatments continued over several years.

Apparently those patients do best who show the greatest tolerance for the rays.

CONSTITUTIONAL REMEDIES

As in tuberculosis, the patient should be placed upon a roborant dietetic and hygienic treatment. To increase the fluorescence of the blood during the X-ray treatment, 5 grains of quinine, 3 to 5 grains of fluorescein or 2 grains of methylene blue may be administered from two to four hours preceding each application of the X-rays. If fluorescent substances are being used locally over denuded surfaces, the administration of similar substances by the mouth is unnecessary.

SERUM AND TOXIN TREATMENT

In those cases in which the administration of Coley's mixed toxins is followed by the disappearance of the tumor, the permanence of the cure, from the statistical evidence at hand, seems greater than after any other form of treatment. Unfortunately, the violent chills, the cephalalgia, the high fever, the weakening sweats, and the general exhaustion which follow the use of mixed toxins not infrequently are considered by the patient as unbearable, and he refuses to be further tortured. Not only is the treatment so distressing, but it is also usually unavailing, for even Coley estimates the treatment as only of value in about 10 to 15 per cent of the cases of sarcoma. Thus, not less than 85 per cent of the patients in whom it is used receive no benefit. We employ the mixed toxins, however, in those cases in which results are not obtained by the other mentioned measures. We have had a limited experience with Doyen's serum without clear evidence of its value, although in Case 1 it apparently checked recurrent and very violent attacks of erysipelas that followed the injection of mixed toxins (probably imperfectly sterilized). We have observed no permanent good effects from the use of trypsin or allied ferments.

The following is a report of the cases in which it was possible to carry out the treatment above outlined. In the much larger number of other patients upon whom this treatment was not employed, and in whom the sarcoma was not of the benign type, a fatal issue has been invariable.

CASE 1. *Sarcoma of testicle following traumatism. incision. Recurrence. Castration. Recurrence in opposite lymphatic glands. Patient in good health after two and one-half years.*

D. X., aged 32, an athletic man, weighing 220 pounds. His family and previous history are negative. In May, 1905, he was thrown against a car seat, contusing the right testicle. Within a week the organ had nearly doubled in size, but was free from pain or tenderness. Careful measurements showed a progressive and rapid increase in size. Three weeks after the injury an exploratory incision was made, with the diagnosis of hematoma. The blood was found to be in the tunica albuginea intermixed with grayish particles, apparently of broken down testicular substance. The situation of the hematoma suggested a diagnosis of sarcoma. A careful examination of a portion of the excised tunic, however, showed nothing more than a round-celled infiltration. The testicular substance was too diffluent for satisfactory examination. The wound was drained, it healed promptly; but several weeks later a progressive testicular enlargement was again noticed. About the middle of September, 1905, there was a large growth within the scrotum adherent to the skin, together with an enlargement of the cord and the inguinal lymphatic glands. The most thorough excision of the growth, scrotum, cord, lymphatic glands, and adjacent tissues was done. Within a month the left inguinal lymphatic glands and later the deeper glands became palpable. The left testicle remained uninvolved. The patient was given injections of Coley's fluid from which apparently he developed severe recurrent attacks of erysipelas. These attacks recurred weekly, were characterized by widespread erythema, chills, high temperature, by diminution in weight and prostration. Doyen's serum was then given and was followed apparently by diminution in the frequency and virulence of the attacks of erysipelas. The patient was referred to Dr. Pfahler November 11, 1905. At this time the scar on the right side was firm, red, and apparently free from recurrence. In the left groin were two masses, one an inch, and the other one and one-half inches in diameter. Within the pelvis behind the left Poupart's ligament there was a firm resistance suggesting deep glandular involvement, and there were severe increasing pains in the lumbar region that raised the suspicion of retroperitoneal invasion. Later the right groin became indurated. He was treated by daily exposures of from twenty to forty-five minutes by X-ray, excepting on Sunday. At the end of two months the treatments were given three times a week. The glands were distinctly smaller, there was some irritation of the skin, and the pubic hairs were beginning to fall out. At the end of the third month, from 64 treatments, the glands were much reduced in size, the patient was working daily, and there was a diminution in the cachexia. At the end of four months, after about 76 X-ray treatments, the tumors were barely palpable. After six months, about 100 treatments, the patient had gained markedly in weight, but there remained a diffuse induration in the groins. The patient took a course in X-ray therapy, bought a coil

for personal use and moved from town, continuing his treatments. During the summer of 1906, after much hard manual labor, and neglect of X-ray treatment, there was an increasing enlargement in the right groin. This was later injected with methylene blue, but the enlargement persisted and finally opened and discharged. In April, 1907, under local anesthesia, an incision was made through the capsules in the infiltrated glands of the left groin, and a subcapsular enucleation of several ounces of broken down malignant tissue made. Repeated applications of methylene blue were used and the X-ray treatment continued, under which there was a gradual disappearance of the infiltration. Later, from improper care the wound developed a putrid discharge, and vigorous antiseptic and cauterizing agents, as previously described, were necessary. The patient, now over two and one-half years from the onset of the symptoms, has gained about thirty pounds in weight during treatment and is in excellent general health. Three other patients with sarcoma of the testicle have come under observation a short time before or since the above patient came under treatment. These patients had been treated by castration, but the local and X-ray treatment, as above outlined, was not applied. Each of these patients died within six months after first coming under observation.

CASE 2. *Enormous recurrent sarcoma of scapula. Prolongation of life for five months under conservative treatment.*

Mr. W. S., age 30, married. Previous history negative. In February, 1905, he noticed a mass the size of a hen's egg over the right scapula. On March 3, 1905, this was excised by Prof. X. In September, 1905, there was a recurrence the size of a hen's egg and a secondary growth in the axilla. September 23, 1905, both growths were excised. In February, 1906, there was a large recurrent growth, and an interscapular thoracic amputation of the arm was urged. The patient then passed from hospital to hospital, but refused amputation. The patient was first seen by Dr. Babcock, October 20, 1906. At this time there was an enormous growth covering the right scapula, extending into the axilla anteriorly, involving the right subclavicular region. It was about one and one-half times the size of a man's head. He was given injections of Doyen's serum, trypsin and methylene blue. The growth progressively enlarged, an area of ulceration, at first the size of a dollar, increased in size, and profuse hemorrhages occurred which were controlled by compresses of turpentine. Intravenous injections of homologous blood were twice given. Great masses of necrotic tumor tissue loosened and were taken away. November 13, 1906, he was referred to Dr. Pfahler for a course of systematic X-ray treatment. He was treated six times a week for two months. To reduce the fetor, to aid in restraining the growth and to increase the fluorescence, applications and injections of strong solutions of methylene blue were employed. Despite these measures, although the growth became somewhat smaller, the area of ulceration and necrosis rapidly increased, the patient became progressively weaker, paler, and more cachectic. After two months of X-ray treatment the man's condition was such that it seemed evident that he would die within two or three weeks, not so much from the tumor itself, but from the sapremia which its necrosis had engendered. The patient was cautiously anesthetized January 12, 1907, and a hurried subcapsular enucleation done. The mass consisted of a great number of disintegrated tumor nodules, enclosed in firm fibrous capsules growing from the anterior and posterior surfaces of the scapula, in the axilla, and over the right anterior thoracic wall, nearly to the sternum. The capsules were split one by one, and the contents shelled out by the hand. The operation required about ten minutes, nearly eleven pounds of tumor being removed through a single opening in the back. Although little blood was lost, the patient was markedly shocked. At the end of three or four days he was able to leave his bed, and ten days after the operation was returned for X-ray treatment. The girth of the chest was reduced ten inches by the operation. He was again treated every week-day for seven weeks, after which he was given three treatments weekly. The wound which was kept continuously coated with methylene blue rapidly contracted and healed. Certain nodules in the axilla, which had been rather neglected during the X-ray treatment, enlarged and were later enucleated under local anesthesia. The patient gained about twenty pounds in weight, lost all cachexia, and had the appearance of good health. The local treatment was also somewhat neglected, and in June, 1907, certain nodules became fetid and necrotic and the patient so rapidly became toxemic that he was unable to go to the X-ray clinic after June 30th. Large doses of trypsin and Coley's fluid were given, hemorrhages occurred, signs of pulmonary involvement developed, and on July 11, 1907, after a third or fourth subcapsular enucleation, the patient died of shock and toxemia. In this case the man was made comfortable and his life prolonged for five months, but we were over-sanguine and reduced the local and X-ray treatment at too early a date. No erythema of note was produced by the rays.

CASE 3. *Recurrent sarcoma of the forearm. Excision. Rapid recurrence. Apparent cure under conservative treatment.*

Mrs. E. P., aged 30, no children. Has never been robust. Six years ago the patient had a curettement, ventral suspension and removal of small ovarian cyst which relieved her of dysmenorrhea. In 1901, a nodule appeared near the right elbow. Ointments were applied, but the mass progressively enlarged and finally it became painful. In October, 1905, the upper forearm had a circumference of 12 inches, and Dr. Y. extirpated the growth which was found to be a small round-celled sarcoma. In three months it recurred and was again removed by the same surgeon, and the surgeon himself gave 32 X-ray treatments, but recurrence took place while under treatment. The treatments were discontinued May 30, 1906, and amputation of the arm advised by a number of surgeons consulted. The patient was first seen by Dr. Babcock, October 15, 1906. There was a soft, fluctuating sub-

Fig. 1. Case 3. Recurrent sarcoma of scapula after two operations. Before treatment.

Fig. 2. Case 3. Increase in necrosis, ulceration and cachexia. After daily treatment with X-rays for two months.

Fig. 3. Case 3. Four months after subcapsular enucleation of the degenerated tumor mass, and subsequent radiations.

cutaneous mass the size of an egg on the outer side of the right elbow, a second mass adjacent to the brachial artery and surrounding the median nerve just below on the anterior surface of the forearm. These tumors were enucleated without dividing the artery or nerve. The growth was chiefly from the fascial planes and periosteum of radius and had destroyed the upper portion of the external muscle group of the for arm. Two weeks after the operation there were distinct signs of recurrence. The patient was referred to Dr. Pfahler, November 5, 1906. Methylene blue was used locally and the daily X-ray treatments of about twenty-five minutes duration given. In ten days there was a diminution in the pain and stiffness with some improvement in the induration. At the end of a month the induration had practically disappeared, but the wound remained unhealed. At the end of five months and 32 treatments the patient had regained a healthy color, had increased in weight and was apparently well. One treatment every one to three months is now used. The patient continues in apparent health fourteen months after operation. A second, almost contemporaneous case of sarcoma, adjacent to the elbow, treated by amputation, without X-rays, was characterized by generalization and death a few months later.

CASE 4. *Round-celled sarcoma of mandible. Imperfect enucleation. Apparent recovery under conservative treatment. Rapid recurrence after extraction of a tooth.*

Miss L. G., aged 8 years. Previous history negative. First seen by Dr. Babcock, May 1, 1907. Patient was struck over left side of lower jaw three months ago. Four weeks later a nodule the size of a marble was noticed upon the external surface of the mandible near the ramus, which has grown rapidly and is now nearly the size of an egg. It is of rather firm consistency, is attached to the jaw and is free from pain or tenderness. Operation in May, 1907, the tumor being exposed and found attached to the periosteum, with perforation of the bone and communications with smaller masses in the medullary cavity. The medullary cavity was partially curetted, the tumor of soft tissues enucleated, the

Fig. 4. Case 2. Recurrent round-celled sarcoma of forearm. Photograph made two weeks after the third operation, showing recurrence.

Fig 5. Case 2. Four months later; 32 X-ray treatments.

Fig. 6. Case 5. Melanotic sarcoma of submaxillary region before operation (scopolamin-morphin narcosis).

wound painted with methylene blue solution, and daily X-ray treatment started. The patient was apparently well seven months after the operation, but had neglected treatment. A tooth was then extracted from the area adjacent to the disease, and within a week a rapidly growing mass had reappeared. Treatment resumed.

CASE 5. *Melanotic sarcoma from skin of jaw. Enucleation. Conservative treatment. Apparent recovery.*

Dr. H., aged 54. Crippled from previous rheumatic attacks, otherwise he has been well. In taking down a bedstead, he hit himself a violent blow under the jaw, in March, 1905. One month later a lump was noticed in the situation of the left submaxillary gland. It was free from pain and tenderness and grew slowly until the summer of 1906, then the growth became more rapid. In May, 1907, the mass was the size of an orange, was covered by bluish veins, movable on the soft tissues beneath, and showed semi-fluctuating soft areas. It is lobular and encapsulated. Enucleated in Dr. Babcock's service by Dr. Steel, May 11, 1907. On section it is found to apparently spring from corium. The wound was painted with methylene blue, sutured, and X-ray treatment started. Apparently the patient is well seven months after operation.

CASE 6. *Recurrent multiple melanotic sarcomata of posterior surface of the leg.*

Mrs. S. A., widow, aged 69. In August, 1903, the skin over the tendo-Achilles of the right leg was irritated by a shoe, and a lump the size of a hickory nut appeared, grew rapidly, ulcerated, and in 1904 was removed under local anesthesia. In 1906, the growth recurred and was injected with chemicals. Later, two other masses developed under the skin at a higher level and grew rapidly. The three growths, which proved to be melanotic sarcomas, were excised by Dr. Babcock under spinal anesthesia, March 3, 1907. The X-ray treatment began March 26th, the patient being in fair condition, although pale and rather weak, and with suspicious induration about the scar. Within a week two new nodules developed above the scar, but the induration and the new growths gradually disappeared under treatment. Methylene blue was administered internally. The patient's general health markedly improved, and nine months after the last operation the induration has almost entirely disappeared, the patient appears well and receives X-ray treatment at intervals of several weeks.

Fig. 7. Case 5. Same patient about four months after operation and post-operative X-ray treatment.

ACUTE OSTEOMYELITIS OF THE SHAFT OF THE HUMERUS. REMOVAL OF THE SHAFT. COMPLETE REPRODUCTION OF THE BONE

By CHARLES L. SCUDDER, M.D.
Surgeon to the Massachusetts General Hospital, Lecturer on Surgery, Medical School, Harvard University

THE importance of utilizing the reparative power of the periosteum in the treatment of certain cases of acute osteomyelitis of the long bones is illustrated by the following report:

The story of this case is briefly told. A glance at the legends accompanying the skiagraphs and photographs here reproduced will afford a very definite picture of the several steps in the treatment.

The patient (Mass. General Hospital number 148,047) was a girl, thirteen years old. The left shoulder had been painful, swollen and tender for two weeks. She had had fever. It had been thought that she had acute articular rheumatism. The swelling of the shoulder extended downward toward the middle of the upper arm. The child was ill. The constitutional effects of the infection were apparent. Two weeks from the onset of the sudden pain in the shoulder, i.e., on June 12, 1906, the swelling was incised through the fibres of the deltoid, evacuating a large amount of pus and

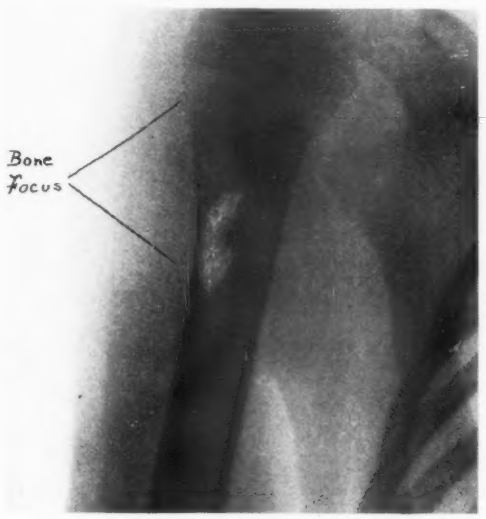


Fig. 1. Osteomyelitis of humerus. X-ray appearance two weeks after the initial pain.

Fig. 2. Osteomyelitis. Five weeks after operation. Note proliferating periosteum and tube draining medulla.

exposing the humeral shaft at the bottom of the abscess cavity, bared of periosteum for two or three inches.

The cortex of the humerus was removed, exposing a purulent medulla (see Fig. 4). The cortex was removed until normal medulla appeared. Thus the bone abscess was thoroughly drained. The medulla was undisturbed by instruments. The medulla was gently washed with salt solution.

Fig. 4. Osteomyelitis of the humerus. Note incision outer side of upper arm, drainage tube in situ, swollen appearance of whole arm, upper end shaft of humerus projecting from wound.

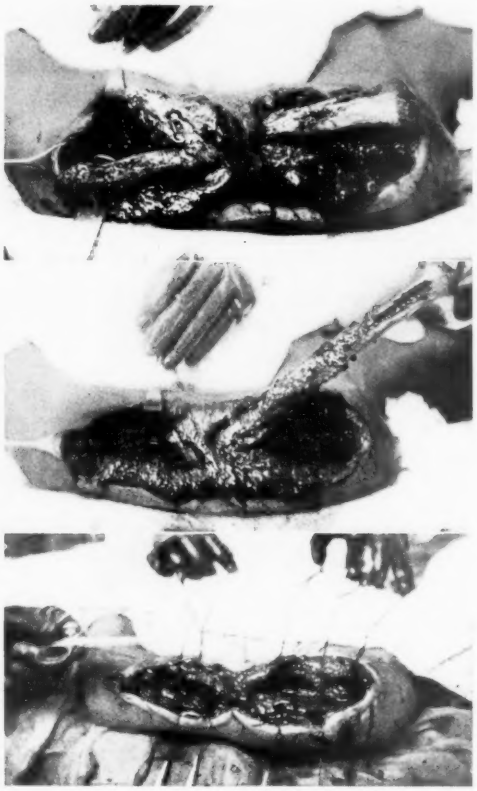
Fig. 3. Acute osteomyelitis. Seven weeks after initial operation.

Fig. 5. Acute osteomyelitis. X-ray appearance ten weeks after the onset of the disease; eight weeks after first operation. Note lower humeral epiphysis.

Fig. 6. X-ray. Twelve weeks after first operation.

Fig. 7. X-ray. Fourteen weeks after operation.

Fig. 8. X-ray. Sixteen weeks after operation.



Figs. 9 10. 11. Osteomyelitis of humerus. Removal of sequestrum (shaft of the humerus) ten weeks from onset; eight weeks from first operation.

June 26, 1906. Because of pain and tenderness and swelling at the elbow, and a rather sudden elevation of temperature, an incision made at the elbow discovered conditions similar to those at the upper end of the humerus, viz., an abscess, bare bone and pus in the medulla of the humeral shaft. Drainage was instituted both of the soft parts and the bone.

July 10, 1906. The shaft of the humerus internally and externally was drained by rubber tubes (Fig. 2). A musculo-spiral paralysis appeared from the pressure of the rubber tube placed outside the shaft. This paralysis disappeared upon the removal of the shaft of the bone August 7, 1906 (see Fig. 9). Comparative X-ray observations upon the activity of the periosteum determined the opportune time for the removal of the shaft of the humerus (see Figs. 2, 3, 5). The whole shaft was removed about ten weeks after the initial symptoms and eight weeks from the first operation for drainage.

The humeral head was removed from the upper part of the wound September 10th. It was not entirely separated at the operation August 7th. The lower humeral epiphysis remained intact. Upon the removal of the shaft of the humerus the periosteal covering of the bone which had formed enough new bone (see Fig. 11), to make it easily handled, was sutured together into a ribbon by interrupted chromic catgut sutures. The periosteal layer felt about as thick and resistant as a thick egg shell (see Fig. 14). Interrupted sutures closed the more superficial wound which extended from the great tuberosity to the external condyle of the humerus. The intervals between the superficial sutures were occupied by rubber tissue drains. Buckling of the periosteal skeleton of the humerus was prevented by placing the arm upon an internal right-angled tin splint and by holding the whole upper extremity suspended in the air by bandages fastened to a cradle over the head. Thus sufficient traction upon the upper arm was maintained, while the forearm was fastened securely to the tin splint.

The progress in the formation of the new shaft was increasingly rapid (see Figs. 6-8). The patient left the hospital October 2, 1906. A small sinus remained open a short time after leaving the hospital.

At present, one year after the new bone had formed and one year and four months after the initial attack of pain, she has the use of the arm as illustrated by the accompanying photographs. There is very little motion at the elbow. There is a little motion at the shoulder. The scapula moves with the humeral shaft in most of its excursions, as indicated in the photographs. The arm is useful and strong. The functions of the forearm and hand are practically normal.

REMARKS

This was a case of virulent infection of the shaft of the humerus by the staphylococcus

Fig. 12. Present condition of the bone as shown by the X-ray. One year and a half after operation.

Fig. 13. Fig. 14.

Fig. 13. Osteomyelitis of humeral shaft. Photograph of bone removed. Cortical bone removed at X for drainage.

Fig. 14. Acute osteomyelitis of humerus. X-ray of humerus after removal. X-ray by Mr. Dodd.

Fig. 15. Fig. 16. Fig. 17. Fig. 18.

Fig. 15. Final condition of arm osteomyelitis. Removal of entire humeral shaft. Voluntary adduction. Fig. 16. Final condition of the arm after removal of entire humeral shaft. Rotation inward, backward swing and adduction. Fig. 17. Final condition of arm. Ostoemyelitis. Removal of entire humeral shaft. Adduction. Fig. 18. Final result. Removal of entire humeral shaft. Voluntary raising of arm and head.

pyogenes aureus. The entire bone suffered almost immediate death.

Drainage of the soft parts and bone resulted in a subsidence of the constitutional symptoms.

Repeated X-ray examinations and palpation of the proliferating periosteum determined the opportune time for the removal of the humeral shaft.

Attention to splinting and traction upon the upper arm prevented any deformity of the newly forming humerus.

Life in the open air and sunshine, from the moment of the first operation, hastened convalescence from the infection.

An osteomyelitis is too commonly mistaken for an acute articular rheumatism.

There is no doubt but that in certain cases of osteomyelitis much is gained for the individual by early removal of the necrotic bone. Many cases should be selected for this special method which are being treated by the delayed operation.

TRANSPERITONEAL URETEROTOMY FOR URETERAL CALCULUS[1]

By GERRY R. HOLDEN, M. D., Jacksonville, Florida

IN approaching the ureter for the purpose of removing a ureteral calculus the extraperitoneal route is, for obvious reasons, almost invariably chosen. The transperitoneal route has at various times been strongly condemned as injudicious, dangerous, and unjustifiable.

While granting that the majority of cases can be easily and properly handled without opening the peritoneal cavity, it still seems that in some instances deliberate transperitoneal ureterotomy is the operation of election.

The patient, a woman 33 years old, was admitted to the gynecological ward of the Johns Hopkins Hospital (Gyn. No. 12,130) in May, 1905. On account of the absence of Dr. Kelly she came under my care. She gave a history of recurring attacks of typical renal colic on the left side for nine years before admission. For five or six months before admission there had been no acute attack, and she finally came to the hospital seeking relief from a constant dull pain in the lower left quadrant of the abdomen.

After careful study we made the diagnosis of calculus impacted in the ureter just at the point where the ureter plunges under the broad ligament, with a stricture of the ureter just below the stone. This diagnosis was based on the following observations:

[1] Read before the Southern Surgical and Gynecological Association at New Orleans, December 18, 1907.

On vaginal examination a slight thickening was felt high up on the left side. Cystoscopic examination showed that no urine came from the left ureteral orifice. A wax tipped catheter passed into the left ureter met an obstruction about 2 cm. from the bladder. As no scratch marks were left on the wax the tip had evidently not been in contact with a stone. An X-ray picture showed the shadow of what was apparently a small ovoid calculus in the course of the left ureter, approximately about 4 cm. from the entrance of the ureter into the bladder.

We concluded that probably no infection had taken place in either the ureter or kidney because during two weeks observation there was no local tenderness, no fever, and no acute attacks of pain; the leukocyte count was always normal, and the bladder urine was proven to be sterile.

Although skeptical of its feasibility we first attempted to remove the stone by the abdominal extraperitoneal route through a lateral incision. The woman was very fat and after a few moments work the impossibility of reaching the affected part of the ureter in this way became manifest. The lateral incision was therefore closed.

The patient was then placed in the Trendelenburg position, the abdomen opened in the median line, and the intestines pushed up out of the pelvis. The pelvic ureter on the left side was found to be dilated to about 2 cm. in diameter. A calculus was felt lying under the base of the broad ligament. The left tube and ovary were removed, the left round ligament cut in two, and by dissecting down through the broad ligament the lower portion of the ureter was exposed. The stone was found in the anticipated location. The uterine artery crossed over its lower third. Apparently the ureter was completely obstructed and the kidney thrown out of function.

After removing the calculus through a longitudinal incision an unsuccessful attempt to pass a ureteral catheter down into the bladder showed the existence of a very tight stricture just below the site of the impaction.

Before incising the ureter the general cavity was so walled off and the field of operation was so surrounded by gauze that the discharge of a large amount of infected urine would not have contaminated the surrounding tissues.

The ureteral incision was closed with fine silk. Extraperitoneal drainage was made from the lower end of the abdominal incision to the wound in the ureter by dissecting the peritoneum away from the abdominal wall and then passing down a strip of gauze. Vaginal drainage was also made by bringing a strip of gauze out through a puncture in the lateral wall of the vagina. Both of these drains were made extraperitoneal by losing the cut peritoneal edges of the broad ligament and reuniting the round ligament. The abdomen was then closed.

The post-operative course was uneventful. As soon as possible we began dilating the stricture with graduated ureteral catheters. It yielded readily to treatment and six months after the operation we could still pass a large size ureteral catheter. The left kidney was then secreting normally.

In this case we chose the abdominal route because it enabled us to do clean-cut surgery, working always with the field of operation in full view, with plenty of room to get at it. Moreover, we were able to examine easily and thoroughly the entire pelvic ureter, and by the hand the rest of the ureter and the kidney. Moreover, by the vaginal route satisfactory examination of the ureter and kidney above the stone and of the stricture below would have been impossible.

The site of the impaction here was higher up than we usually find in the cases of stones impacted in the lower portion of the ureter. The affected part of the ureter was not in contact with the vagina nor was it near it. It was separated from the vagina by the lower part of the broad ligament, the large vaginal plexus of veins, and the vaginal branch of the uterine artery, while in intimate contact with it above lay the main trunk of the uterine artery with its several veins. We considered that the danger associated with blind work in this location was greater than the danger from laparotomy. The removal of the left tube and ovary was regarded as a justifiable means of thoroughly exposing the lower portion of the ureter.

The danger of peritoneal infection in laparotomy we considered slight. Apparently there was no infection of the ureter, certainly no vigorous infection. Any infection which could possibly be present could be easily taken care of by proper disposal of gauze during operation and extraperitoneal drainage at the close. This extraperitoneal drainage also precluded the possibility of post-operative intraperitoneal extravasation of urine from a leak at the incision in the ureter.

As I have already stated an abdominal extraperitoneal operation was impossible on account of the thick abdominal walls.

I do not believe that transperitoneal ureterotomy for ureteral calculus is often the operation of election. I do believe, however, that it is the best operation when the stone is impacted at or just above the uterine artery, provided we are reasonably assured that infection is either mild or else absent altogether.

REPORT OF A CASE OF PUBIOTOMY[1]

By THEO. J. DOEDERLEIN, M. D.

The history of the following case is not as complete as it should be, nor does the technique concerned present new features. There are, however, a few features, which I deem worthy of scientific interest and consideration.

Mrs. M., a primipara, was sent to my service at the German Hospital, late one evening, her physician, a very competent man, having spent most of the day and evening in the lying-in chamber. With the assistance of another physician, forceps had already been applied without avail. When I saw the patient she had very frequent and inefficient uterine contractions, a weak rapid pulse, and other evidences of exhaustion. Prompt action seemed imperative.

On examination I found the head at the pelvic inlet, semi-extended, so that both fontanelles could be felt. The promontory of the sacrum projected sharply into the pelvic cavity. The pelvic measurements were: Interspinous 21 cm.; intercristal, 24 cm.; external conjugate, 14 cm.; the true conjugate, estimated at 8 cm. The fetal heart sounds could not be heard. After careful preparation, attempt was made to flex the head. This was found impossible. Axis traction forceps were then applied with much difficulty, hoping they might guide the head around the sharp curve of the pelvic brim, but the head could not be engaged with a reasonable amount of force. Although the fetal heart sounds could not be heard, I wished to give the child a fair chance for life and, therefore, decided to do pubiotomy, rather than craniotomy.

An incision was made over the pubic bone in a sagittal line, running through the tuberculum pubicum, after the labium majus had been well drawn to the opposite side. The incision was quickly carried down to the periosteum, which was pushed aside with a Kocher's elevator. At this time there was considerable venous hemorrhage from the crus of the corpus cavernosum clitoridis, which, however, was readily controlled by pressure. The ligature carrier was then passed from below upwards, after the method of Zangemeister, and with a Gigli saw the bone was divided. The reason for passing the needle from below upwards, was convenience in this case, although Zangemeister prefers this method, because it is more apt to avoid injury to the corpus cavernosum clitoridis, and to the bladder. The child was then delivered by version.

The pelvic axis had so sharp a curve and the sacrum seemed so prominent that it was even difficult to introduce the hand. As might be expected, the child was dead, as a result of the long-continued labor and the repeated futile attempts to deliver with forceps, and the difficulties encountered in extracting the after-coming head. The wound healed per primam, save for a stitch-hole abscess. There was, however, intense œdema of the labia, and temperature of 103° on the fourth day, which shortly fell to normal. The patient was up and about in three week's time. Three months later I examined her and found perfect union, but slight tenderness over the pubic bone.

Unfortunately the weight and measurements of the child were not taken. I remember, however, that the fetus was large and presented a well-developed paniculus. The patient was 23 years old; weight, 123 pounds; had a height of four feet seven inches; had had typhoid fever, rheumatism, cerebro-spinal meningitis, a cleft palate, and indications of rickets, as was shown by deformities of head, thorax, pelvis, and lower extremities. She began to walk when about three years of age and was small and sickly throughout her childhood. She was an artificially fed baby and took the bottle up to five years.

We had then, in this case, a flat rachitic pelvis, with a well-marked sacral promontory, receding sacro-iliac articulations, and greatly increased pelvic obliquity. Edgar thus describes rickets: "The pelvis, as a whole, is undersized, having a distorted inlet, which is often kidney-shaped. The promontory of the sacrum is abnormally prominent. The obliquity of the pelvis is increased. The iliac bones are so flared that occasionally the spines are farther apart than the crests. The sacrum tends to rotate, imparting a backward impulse to the lower part, but this is offset by the firm grasp of the ligaments, and a curve thus results. The bodies of the sacral vertebræ are pushed forward at the expense of the alæ." A careful consideration of this description shows why delivery proved so difficult in our case, even though the pubiotomy gave a diastasis of 3 cm.

Although Von Cauvenberg found that on the cadaver a separation of 4 cm. at the pubis increased the diameter of the conjugate from 1½ to 2 cm., and in the living subject the increase was still greater due to the mobility of the sacroiliac articulation; Waldstein points out that in rachitic

[1] Read by invitation before the Chicago Gynecological Society, November 15, 1907

pelves, in which the sacral prominence is extremely marked, the true conjugate is shortened rather than elongated by pubiotomy. The reason for this, I think, is obvious, inasmuch as the sacral promontory becomes more prominent as the ossa innominata are allowed to swing back on their articulations. For this reason W. Stöckel states that the operation should not be performed on pelves with true conjugates of less than 8 cm. Henkel, of Olshausen's clinic, believes, however, that the operation is applicable in flat pelves, with conjugates of 6¾ cm. or 7½ cm. in generally contracted pelves. It would appear, however, that he is not optimistic with regard to the possibilities of pubiotomy. It also appears to me that in primary cases in which there is an indisputable disproportion between the child's head and the bony pelvis, Cæsarean section is the more scientific operation. This operation should not be more dangerous than the ordinary laparotomy, and the child is saved the injurious effects of delivery through the natural passages. It is, of course, assumed that Cæsarean section should be performed only by a competent operator under proper conditions. In secondary cases, *i.e.*, in cases where long continued attempts at delivery have been made, and the Cæsarean operation is contra-indicated for obvious reasons, pubiotomy, or, if need be, any pelvic osteotomy, may be considered in preference to craniotomy.

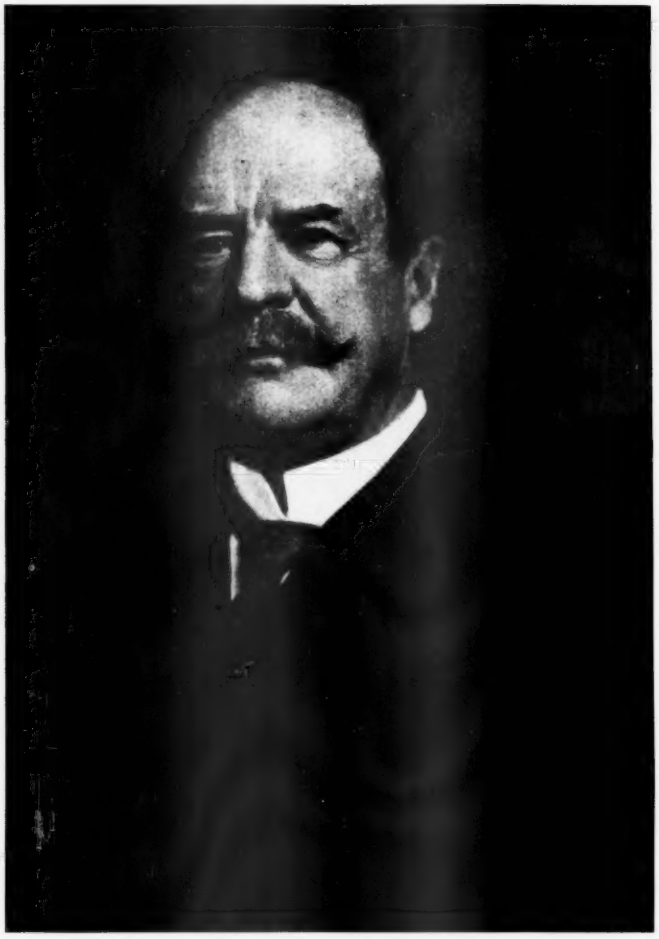
From careful study of my case another condition of the pelvis suggests itself to me, of restricting the limitation of pubiotomy, namely, ankylosis of the sacro-iliac articulation. Unilateral synostosis produces the oblique Nægele pelvis, and bilateral synostosis the Roberts pelvis; these, of course, are excluded in this case. In my case the patient had had articular rheumatism, probably of the sub-acute type, as shown by the greatly limited range of movement of the hip-joints: would it not be reasonable to believe that the rheumatism had a similar effect on the sacro-iliac joints, producing there an ankylosis? My reason for so thinking is that the pubic bones after division could be separated but about 2 cm., and there was no difficulty in holding the cut ends in juxtaposition. Other factors may have given rise to the same conditions. I wish, however, merely to emphasize that ankylosis of the sacro-iliac joint, however rare, still may be a cause why pubiotomy may fail to accomplish its purpose.

A study of the literature gives the following as to the prognosis of pubiotomy: Montgomery in 133 collected cases found no maternal deaths in the cases which were regarded as aseptic at the time of operation. (He does not mention the results in infected cases.) Gigli tabulates 100 cases without mortality On the other hand, Frey reports 12 primary cases without mortality, and 8 secondary cases with a mortality of 50 per cent. He gave the following as causes of death: Shock, on the second day; sepsis, on the fifth day; embolism, on the eleventh day; septic phlebitis and pulmonary embolism in the fourth case. In Frey's series the infant mortality was 40 per cent. Only one death, however, followed primary operation.

In conclusion, allow me to add a few remarks as to the technique of pubiotomy: Two methods are recognized, the open and the subcutaneous. Gigli thus describes the open operation: "The incision extends from the middle line above, downward and outward beside the labium majus to the lower edge of the pubic bone, about the region of the sub-pubic tubercle. No large blood vessels are encountered. It is not necessary to dissect the tissue from the bone. The ligature carrier is then carried behind the os pubis from above downward, its course behind the bone being controlled by fingers in the vagina. A large silk ligature is now drawn through and the saw attached and drawn into place." Van de Velde, Tandler and Zangemeister make their incisions lower, and the two latter pass the needle up from below. The subcutaneous method was proposed by Doederlein, whom I had the honor to assist in his private clinic. He punctures the skin above and below, and passes the saw around the bone by means of a specially devised needle. This method has many obvious advantages and numerous adherents. It appears to me as the simplest and safest way of severing the bone, if the patient it not too obese. When the head is pressing upon the pubis, Doederlein makes a small horizontal incision and separates the bladder by one finger introduced through the wound. Rissmann advocates drainage of the prevesical space. In extreme pelvic contracture or pre-existing inflammation, Rühl separates the bladder from the bone through the incision made in the vagina.

Pubiotomy is usually done on the side to which the occiput points. Rosenfeld holds that the pelvic increase in flat rachitic pelves is equal on both sides, after the separation of the pubis.

Pubiotomy has met with much favor in this country and abroad, and in properly selected cases, I think, has come to stay. There must always remain, however, a large proportion of pelvic abnormalities in which the operator has constantly to use conservatism and good judgment. Premature delivery must always be considered carefully in the early cases of pregnancy in contracted pelves.



JOSEPH D. BRYANT, M.D.

DEPARTMENT OF
NICHOLAS SENN FESTSCHRIFT

FRACTURE OF THE SURGICAL NECK OF THE FEMUR, WITH INVERSION OF THE LIMB

By JOSEPH D. BRYANT, M.D., New York City, New York

Knowledge is of two kinds. We know a subject ourselves, or we know where we can find information upon it. — Samuel Johnson.

THE aptness of this utterance is well illustrated by the fact, that we "ourselves," though for many years circumstanced so as to experience the opportunity, have only lately met with an instance of what we at first regarded to be the above form of injury, and therefore have sought "where we can find information upon it." And it is our special delight to submit this information as an humble contribution to the garland of respect so willingly woven by the medical profession in token of regard for Dr. Nicholas Senn.

On July 22, 1906, I was hastily summoned to consult with Dr. Kadian, of New York City, regarding a patient who had sustained a severe injury of the left hip and thigh five days before, from being "squeezed and twisted" between the long side step of a moving street car on which the patient was riding, and a heavily laden vehicle going in the opposite direction, and finally the patient was thrown to the ground, but not run over by either vehicle.

The accident happened so unexpectedly and was attended with such a degree of confusing and rapidly changing conditions that it was wholly impossible for the patient — a lusty, intelligent policeman — to give a sufficiently connected history of the affair, to be of definite utility in expressing satisfactorily the traumatic circumstances relating to the injury. It, however, appeared that immediately following the receipt of the injury the patient was taken by ambulance to a near-by hospital where, while under ether, he was subjected to an extended manipulative examination for the purpose of diagnosis, and, as the result of which, he was told that he had sustained a fracture of the neck of the femur. A little later he was removed from the general to a private hospital, where he came under my observation.

The physical examination showed the following: The left hip and thigh were badly contused at the anterior and outer aspects and were so greatly distended with extravasated blood as to render the integument tense and shiny, obliterating the topographical landmarks of these parts. The patient insisted that the increased size and distension of the limb was largely the result of the examination made under ether, and gave a history of the appearance of the limb before and immediately after the examination which could leave but

little doubt that the forcible manipulation had contributed not a little to the disturbing appearances which the part presented.

Internal rotation of the limb was pronounced (30°) and quite obstinate. The opposition to external rotation appeared quickly, increased rapidly, and the movement was arrested (not suddenly) at about the angle of 20°. The pain attending this movement (located at the upper and anterior aspect of the thigh) was marked at the beginning of the movement, increasing proportionately with the extent of outward rotation and becoming quite unbearable at the ending of the act. The injured limb was two inches and a half shorter than the other, which shortening, however, could be easily reduced to an inch and a half by means of steady manual traction. As before remarked, the distension of the soft parts about the hip and thigh with blood, together with tenderness on pressure, made impossible the utilization of the relations of the bony points in diagnosis. The injured limb was slightly flexed and could not be restored to the horizontal plane of its fellow without severe pain at the upper and anterior aspect of the thigh and by slight arching of the lumbar spine. These manifestations aroused at once a belief that dislocation of the hip might be present.

Owing to the distended condition of the soft parts of the thigh and hip and because of the increase of the general temperature (102° F.), it was thought best not to interfere for farther diagnostic purposes at this time, but instead to make the patient comfortable pending an interview with the surgeon who had already, as it appeared, made a thorough examination under favorable circumstances, a few days before.

Accordingly, a conference was had with the surgeon on the following day, who said that the patient in question on coming under his charge had a much swollen and bruised hip and thigh with considerable pain. The limb was shortened three inches, slightly flexed and decidedly inverted, and after careful examination under ether he came to the conclusion that the patient had sustained a fracture of the anatomical neck of the femur which was attended with marked inversion. The surgeon also volunteered the statement that the medical men who were present at the time of the examination were agreed with him regarding the diagnosis.

As the result of the previous record of the case and the state of the patient it was deemed wise, for the time at least, to apply to the limb a Buck's extension, together with a long side splint, the limb being arranged, with reference to the apparatus, so as to be slightly raised from the bed and rotated firmly outward, and thus held by the means of adhesive plasters, bandages, and sand bags. In this manner the patient rested comfortably. The traction of ten pounds diminished the shortening to an inch, and five degrees more of external rotation attended the change. An increase of five pounds reduced the shortening to five-eighths of an inch and the limb to the same plane as its fellow, with slight, though painless arching of the lumbar spine. It is proper to say at this time that as the extravasated blood in the thigh lessened, external rotation

correspondingly increased during the three days which the patient was under my observation, and for this period external rotation was not decidedly arrested, but instead was gradually obstructed, as though slowly wound up by the presence of some generally restraining agent, which was regarded to be the extravasated blood lying throughout the muscular planes of the thigh.

At this time the patient passed from my observation, not again being seen by me until the middle of November.

On my departure from the city the question of fracture of the anatomical neck of the femur with inversion (as decided by the surgeon who had examined the injury under ether a few days before) or dislocation were in mind, the former (because of the examination) seeming to me the more likely.

It was determined that the injury should be at once subjected to the diagnostic scrutiny of X-rays, and that further consultation should be solicited in the event of a consequent need for it.

As I had not seen a case of fracture of the neck of the femur with inversion, it was determined to cause the literature of this form of injury to be searched during the summer, in order to report the information thus gained as soon as possible in the fall. Accordingly, under my direction, my assistant, Dr. Wm. M. Ford, took the matter in hand, with the following results.

The search directed to the published cases was made along the following lines of inquiry: The name of the surgeon; sex of the patient; the location of the seat of the fracture, *i. e.*, whether intra- or extracapsular, and the condition of the parts; history of the case; results, died with autopsy; unimproved, cured, result not stated, those cases "discovered" on autopsy, remarks, and the bibliography. The names of the surgeons and the sex of the patient were introduced in order to identify the respective cases and the sources of information relating to them. The location of the seat of fracture was made a part of the record, so that inferences might be deduced relating to the abnormal anatomical evidences suggestive of the peculiar deformity which attends them, and for the same reason the peculiar state of the capsule of the joints is recorded in the respective fractures; also the relation of the capsule to the seat of the fracture, *i. e.*, intra- or extracapsular. The tabulated history of the cases might also point to a method of injury which would prove enlightening in the estimating the peculiar effect of the injury. The results, especially as related to autopsy, are of significance because of affording the opportunity to study any peculiar arrangement of the injured parts, looking to the cause of deformity. The bibliography is necessarily extended and can be readily reviewed, should one care to make the attempt.

Patient and painstaking search has resulted in the reporting of forty-four cases of fracture of the neck of the femur (see table), with inversion of the limb. Of this number fifteen were intracapsular fractures, eighteen extracapsular, and in eleven the seat of fracture was not stated. In thirty-three a history was given. (The histories of the cases are omitted, for to include them would increase impracticably the length of the paper.) In eleven no history

was found. In twenty-six of the forty-four cases autopsies were made, and are a part of the history of these cases. In twenty-one instances autopsy was a part of the immediate history; in five, only a part of remote record. In these five of the total number of cases (44) the condition of fracture was described on autopsy, no previous history of these cases being found. Of the remaining eighteen cases, four are said to have been cured (?), and in thirteen the final result is not stated. Of the fifteen intracapsular fractures, eleven autopsies were made; and of the eighteen extracapsular fractures, fifteen autopsies were made — making twenty-six in all. A comparison of the various opinions based on academic reasons and those founded on autopsy findings relating to the causes of inversion of the foot in certain fractures of the neck of the femur, is rather more interesting than instructive.

SOME REASONS FOR INVERSION

The reasons of various surgeons regarding the cause of inversion of the foot in fracture of the neck of the femur. The numbers attending the names refer to the main chart and bibliography immediately following. The reasons are divided into academic and those based on observation and autopsy.

ACADEMIC REASONS

BREWER (1): Inversion may be present at first, due to the direction of the fracturing force. Says that it is rare.

BRYANT (2): Inversion is "due to the direction of the fracture of the bone and of the fracturing force."

ROSS & CARLESS (3): State that it is probably due to violence directed from behind forward, and to impaction of fragments. Regard the condition as being rare.

ALBERT (4): Due to anomalous fracture of bone.

DUPUYTREN (5): Attributes the inversion to the relative position of the fragments.

BRUN (6): Suggests that simple fracture above or below the lesser trochanter or a simultaneous fracture of the neck and "introchanteric" region may cause inversion.

GOYRAUD (7): Believes that the lower fractured surface slips behind the head of the bone, thus throwing the great trochanter forward; thus the neck is clamped between the capsule and the head of the bone and is fixed in place by the gluteus medius.

LONSDALE (8) & MOULLIN (9): Believe inversion is due to locking of the fragments "within one another" by the force that produces the fracture. Lonsdale adds: "Another cause not unlikely" is for the upper end of the shaft to be driven through the capsular ligament, in such a manner that it can not be turned outward until extension is made. This form of injury is rare.

1. Text-Book of Surgery, 1903. Brewer.
2. Practice of Surgery, 1884. Thomas Bryant.
3. Manual of Surgery, 1905. Ross and Carless.
4. Lehrbuch der speciellen Chirurgie, 1898. Albert.
5. Principles and Practice of Surgery, 1853. Pirrie.
6. Clin. Chirugie, 1844, vol. 1. Nelaton.
7. Lehrbuch der Chirurgie, 1874, 7th ed., vol. ii. Bardeleben.
8. A Practical Treatise on Fractures, 1838 (London). Edw. F. Lonsdale.
9. Mansell Moullin, 1895, 3rd ed.
10. { Science and Art of Surgery, 1860. Erichsen.
    { Principles and Practice of Surgery, 1878. Ashhurst.

ERICHSEN (10): Believes inversion is caused (at least in some cases) by temporary paralysis of the external rotators.

REASONS BASED ON OBSERVATION AND AUTOPSY

Direction of Force

GRIEG (11) & SMITH (12): Inversion is due to the displacement of the lower fragment in front of upper.

POWERS (13): Says, "It would appear that the direction of the force which produced the fracture was that most likely to impel the external fragment in the anterior direction — the very position which it occupied with regard to the superior or internal fragment,— and thus determine the inverted position of the limb."

Periosteal Bands

OZENNE (14): Says, "The persisting band of periosteum at the lower border of the neck and the peculiar character of the break were doubtless responsible for the inversion."

PIRRIE (15): Says, "I believe that the integrity and tension of the ilio-femoral ligament was the cause of the adduction, flexion and inversion of the limb." Occurs occasionally.

Interposition of Bone

LINHART (16): Believes that the commonest cause of inward rotation is the interposition of one fragment of bone between two others, as seen in his case.

Muscular Action

FAYRER (17): Thinks that in his case inversion was mainly due to muscular action.

GUTHRIE (18): Considers it probable that the inversion arises from a diagonal fracture through the trochanter major, so that the gluteus medius and minimus with the tensor vaginæ femoris draw the thigh bone forward and rotate it inwards.

BURNS (19): Inversion "is readily explained by the bruising and resulting incapacity of the external rotators. But inversion may occur in intracapsular fracture when the same explanation may hold good, although a number of others have been offered."

NOTE

BEVAN (20) & MALGAIGNE (21): Each offer extensive explanations which were not included in the foregoing.

The infrequency of this variety of manifestation of injury is emphasized by the fact that Agnew, Boyer, Cloquet, Louis, Nelaton, Sabatier, and many others of extended observation never had had their attention directed to a case of this kind. According to Ashurst, it "has been observed;" to Bardeleben,

11. Edinb. Med. J., vol. xl, Part II, 1895. David M. Grieg.
12. A Treatise on Fractures in the Vicinity of the Joints and on Certain Forms of Dislocations, 1854 (Dublin). Robert William Smith.
13. Dublin Medical Press, 1861. J. H. Powers, F. R. C. S.
14. Le Prog. Méd., 1877, V. Ozenne.
15. The Lancet, 1879, vol. i (London). William Pirrie.
16. Oesterr. med. Wochenschr., 1845, No. 18. Linhart.
17. Clinical and Pathological Observations in India, 1873. J. Fayrer, C. S. I., M.D., F.R.S.E.
18. { A Treatise on Fractures, 1859. Joseph François Malgaigne.
    { A Treatise on Fractures, 1844. Astley Cooper.
19. Principles of Surgery, vol. i, 1838. John Burns.
20. Dublin Q. J. M. Sc., vol. x, August and November, 1850. Article xi, Philip Bevan.
21. A Treatise on Fractures, 1859 (Philadelphia). Joseph François Malgaigne.

it "occurs with great rarity;" and to Sir Astley Cooper, it is "extremely rare." In sixty cases of fracture of the neck of the femur, Cloquet did not see inversion of the limb. Linhart, Pirrie, Tillmanns, and Wyeth regard it as being very infrequent. Benjamin Bell, B. Cooper, Wharton, and Curtis do not mention the presence of such deformity in fracture of the neck of the femur.

In conversing, at different times, regarding this variety of deformity, with surgical colleagues of extended experience, many have disclaimed having seen a case, others are uncertain, and a very few regard it as being not uncommon. I have a notion that this deformity in fracture of the neck of the femur is so rare as not to have attracted attention, except, perhaps, in such a disjointed way as not to invite continuous thought concerning the matter.

It is not needful that the author shall assign reasons for the deformity which in his case prompted the searching of the literature relating thereto, since but casual reading of the following outcome of the case will alone account for the inversion without the exercise of a present imagination or the utilization of a past experience.

'Tis but to know how little can be known,
To see all others' faults and feel our own.
ALEXANDER POPE.

On returning from the country about the first of October, at once Dr. Kadian was communicated with regarding the case in question. It appeared that soon after my departure, early in the summer, the patient sustained an acute and somewhat protracted attack of lobar pneumonia which made it impossible for the employment of special means in diagnosis, and also that the time was nearly all consumed in attention to the immediate demands of the patient, irrespective of the injury itself. At once, however, the patient was placed in the hands of Dr. Cauldwell, a well-known expert in X-ray matters. He reported that the patient had dislocation of the head of the femur on the dorsum ilii, complicated with fracture of the brim of the acetabulum. That the femur was dislocated, an examination of the patient at this time readily disclosed. It was not quite certain, however, that I could find on the negative any evidence of fracture of the brim of the acetabulum, as was confidently expressed by Dr. Cauldwell. The presence of bony crepitus so certainly experienced by the surgeon who first examined the patient, aided by the effect of anesthesia, served to emphasize the probability of the correctness of Dr. Cauldwell's opinion regarding fracture of the brim of the acetabulum. It is proper to say at this time that Mr. Mason, the distinguished photographer of Bellevue Hospital, confirmed the opinion of Dr. Cauldwell after a careful examination of a negative made by himself while the patient was in the Hospital. Believing that the presence of this fracture might account largely for the ability to reduce the shortening of the limb to less than three-quarters of an inch at the time of first meeting with the patient, and also account for the bony crepitus discovered by the examination made in the first instance, and possibly opportunity in reducing the dislocation, it was determined at

once to make the trial at the earliest time. Accordingly the patient was anesthetized, and earnest and continued efforts were made to overcome the dislocation, but without effect. In a final trial, however, attended with increased effort, the neck of the bone was fractured. This accident, however, was not regarded as a special misfortune, since it permitted of a much better adjustment of the limb, which could then be reduced to within an inch in length of the normal limb and with the alignment of the foot and thigh in proper relation to the opposite one. The patient remained in the hospital in bed under common treatment for fracture, without special pain, the usual length of time and was discharged with an inch shortening, and otherwise was not unusually afflicted by reason of the displaced head of the bone.

Veritatis simplex oratio est.—SENECA.

BIBLIOGRAPHY OF 44 CASES OF FRACTURE OF NECK OF FEMUR WITH INVERSION, NUMERICALLY ARRANGED

CASE 1. Observations on the treatment of fractures of the upper third of the thigh bone, 1828 (London). Joseph Amesbury.

CASE 2. Observations of the treatment of fracture of the upper third of the thigh bone, 1828 (London). Joseph Amesbury.

A treatise on fractures, 1844 (Philadelphia). Astley Cooper.

CASE 3. Observations on the treatment of fractures of the upper third of the thigh bone, 1828 (London). Joseph Amesbury.

CASE 4. A treatise on fractures, 1844 (Philadelphia). Astley Cooper.

A practical treatise on fractures, VIII edition, 1891 (Philadelphia). Frank Hastings Hamilton.

Med. Chir. Trans., vol. xiii, 1827 (London). George Langstaff.

CASE 5. A treatise on fractures, 1844 (Philadelphia). Astley Cooper.

CASE 6. A practical treatise on fractures and dislocations, VIII edition, 1891 (Philadelphia). F. Hastings Hamilton.

CASE 7. A practical treatise on fractures and dislocations, VIII edition, 1891 (Philadelphia). F. Hastings Hamilton.

CASE 8. A practical treatise on fractures and dislocations, VIII edition, 1891 (Philadelphia). F. Hastings Hamilton.

Columbus (Ohio) Med. J., Nov., 1882. W. J. Conklin.

CASE 9. A practical treatise on fractures and dislocations, VIII edition, 1891 (Philadelphia). F. Hastings Hamilton.

CASE 10. A practical treatise on fractures, 1838 (London). Edw. F. Lonsdale.

CASE 11.
CASE 12.
CASE 13. } A treatise on fractures, 1859 (Philadelphia). Joseph François Malgaigne.

CASE 14.
CASE 15.
CASE 16.
CASE 17.
CASE 18.
CASE 19.
CASE 20. } A treatise on fractures in the vicinity of the joints and on certain forms of dislocations, 1854 (Dublin). Robert William Smith.

CASE 21.
CASE 22. } A treatise on fractures, luxations and other affections of the bones, III edition, 1817 (Philadelphia). Pierre Joseph Desault.

This accompanying table shows the number of each case, name of the surgeon, sex of the patient, location and condition of the fracture, also other import

Number of Case	Surgeon	Patient Sex	Location of Fracture			Violence			Shortening	Position of Limb						Motion	Crepitus	Position of Trochanter Major	Results					
																			Died					
			Intracapsular	Extracapsular	Not Stated	Direct	Indirect	Not Stated		Rotation Inward	Rot. Inward Then Outward	Rot. Outward Then Inward	Flexed	No State. as to Flexion	No State. as to Adduction	Adducted				Autopsy	No Autopsy	Unimproved	Cured	Result Not Stated	Discovered at
1.	Stanley	Man	1					1	1 inch	1				1	1			⊙		1					
2.	Guthrie	Female		1		1			½ inch	1				1	1		Free Painful	⊙		1					
3.	Syme	Male		1		1			1 inch	1				1	1		Painful		Upward Forward	1					
4.	Langstaff	Female			1	1						1		1	1					1					
5.	Cooper	Female	1			1			+	1				1	1		Painful			1					
6.	Cruveihier	Not stated	1					1		1				1	1									1	
7.	Biglow	Not stated		1				1		1				1	1										1
8.	W. J. Conklin	Female		1		1			1 inch	1			1		1		Painful	⊙	Upward Forward	1					
9.	Hamilton	Not stated	1					1		1				1	1									1	
10.	Lonesdale	Not stated			1			1		1				1	1									1	
11.	Malgaigne	Female	1					1		1				1		1									1
12.	M. Mercier	Not stated		1				1		1				1	1									1	
13.	M. Michon	Not stated		1				1		1				1	1									1	
14.	Smith	Female	1					1	¾ inch	1				1	1					1					
15.	Smith	Male		1				1	2 inch	1				1	1					1					
16.	Smith	Male		1				1	2 inch	1				1	1					1					
17.	Smith	Male		1		1			4 inch	1				1	1			⊕	Upward	1					
18.	Smith	Female		1				1	1¼ inch	1				1	1		Slight			1					
19.	Smith and Fleming	Female	1			1			○	1				1	1		Painful			1					
20.	Smith	Female		1		1			1½ to 2 inch			1		1	1					1					
21.	Desault	Female			1	1			1 inch	1				1	1				Upward Backward				1		
22.	Desault	Male			1		1			1				1	1								1		
23.	Hudson	Male			1	1			○		1		1		1		None at hip	⊕						1	
24.	Gulliver	Male		1		1			+	1				1	1					1					
25.	Bevan	Female	1					1	½ to 1½ inch	1				1	1			⊙							1
26.	Fayrer	Female	1			1			1 inch			1	1		1			⊕		1					
27.	Griec (Tempelman)	Female		1		1				1				1		1			Upward	1					
28.	Grieg	Female		1		1				1			1			1			Upward Forward		1				
29.	Wessinger	Male	1			1			1 inch	1			1		1			⊙	Upward				1		
30.	Erichsen	Not stated	1			1				1				1	1									1	
31.	Erichsen	Not stated	1			1				1				1	1									1	
32.	Pirrie (Rodgers)	Female	1			1				1			1			1	Present Painful	⊕		1					
33.	Pirrie	Not stated	1					1		1				1	1					1					
34.	Paré	Female			1			1		1				1	1									1	
35.	Dupuytren	Not stated			1			1		1				1	1									1	
36.	Dupuytren	Not stated			1			1		1				1	1									1	
37.	Petit	Male			1			1		1				1	1				Upward				1		
38.	Fealdman (Bennett)	Not stated		1				1		1				1	1				Upward Backward						1
39.	Ozenne	Female	1			1				1				1	1		Painful Slight		Upward	1					
40.	Powers	Female		1		1			2½ to 2¾ inch		1		1		1		Painful Slight	⊕	Upward	1					
41.	Linhart	Not stated		1				1	+	1			1		1		Slight		Upward						1
42.	John Burns	Female		1		1			+	1				1	1					1					
43.	Mosetig von Moorhoff	Not stated			1	1			○	1			1		1		Slight	⊕						1	
44.	Mosetig von Moorhoff	Not stated			1	1				1				1	1									1	
	Totals		15	18	11	23	1	20	19 Short'ng reported	39	2	3	9	35	40	4	Painful 8	⊕ 6 ⊙ 5	U=7 U B=2 U F=3	21	1	0	4	13	5
	Grand Total				44				3 No Short'ng								No motion at hip, 1								44

+ Shortening amount not stated. ○ No shortening. ⊕ Crepitus present. ⊙ Crepitus not present. U Upward. B Backward. F Forward.

er Import

TS

racteristics relating to 44 instances of inversion of the foot of the injured limb; the findings of 21 cases coming promptly to autopsy and of 5 others autopsied at later periods.

CURED	RESULT NOT STATED	DISCOVERED AT	DETAILS RELATING TO CASES OF FRACTURE WITHIN THE CAPSULE	CONDITION OF THE CAPSULE IN INTRA- AND EXTRACAPSULAR FRACTURES	DETAILS RELATING TO CASES OF FRACTURE. FRACTURE OUTSIDE THE CAPSULE	REMARKS BEARING ON EARLY APPEARANCES OF THE INJURED PART
			acture of neck within the capsule entirely	Not torn anteriorly.		
				Uninjured.	1. Little trochanter (with psoas and iliacus) broken off. 3. Fracture from upper part of trochanter major diagonal to trochanter minor.	Swelling and contusion. Limbs not of equal length by traction.
				Uninjured.	1. Fracture through trochanters obliquely downward and inward. 2. Fracture through the neck at junction of shaft.	
			Fracture at base of cervix (presumably within the capsule)	Greatly thickened.	"Fracture between the two trochanters."	
			Head broken off within the capsule.			Muscles rigid.
1						
	1				Comminution of shaft separating walls, into which interval was received the whole neck.	
					1. Lesser trochanter broken off. 2. Impacted fracture through anterior and posterior intertrochanteric lines; whole neck is driven into cancellated structure of the shaft.	Shortening not overcome by gentle traction.
1						
1						
		1	Head broken off within capsule.	Worn away below, thick above		
1						
1						
			Fracture within capsule obliquely from above downward and forward.	Cervical ligament perfect along concavity of bone.		
					Transverse fracture at junction of cervix and shaft. Trochanter major and minor each broken off.	
					Neck of bone broken transversely at its base. Portion of bone which constitutes intertrochanteric space together with lesser trochanter detached from shaft, comminuted and displaced.	
				Evidence of chronic rheumatic arthritis within the capsule.	1. Neck of bone fractured at its base. 2. Trochanter major broken obliquely from shaft. 3. Trochanter minor broken obliquely from shaft.	Considerable swelling.
					1. Neck of bone driven into cancellated tissue of trochanter. 2. Fracture separating lesser trochanter and posterior ½ of great trochanter from shaft.	Admitted of slight eversion.
			Neck of bone fractured within capsule. Fragments impacted.			Eversion caused pain. Inverted limb not shorter, the other fractured 20 years before.
					Neck of femur fractured external to capsule, it had been driven into the cancellated tissue of the lower fragment breaking off the entire trochanter major. Anterior surface of femur turned inwards.	Effort to walk increased shortening and caused inversion.
						Rotary motion of trochanter on its axis.
1						Chloroform. Limb straightened. Crepitus, free motion, tendency to eversion.
					Fracture of neck at junction with shaft detaching posterior part of troch. major and whole of troch. minor with the upper fragment	
		1	Neck of bone absorbed. No new bony deposit had taken place.	Capsular ligament thickened, otherwise perfect.		Pressure on heel increased shortening 1 in. and inversion. Rotation outward to normal.
			Neck of bone comminuted, a few small detached fragments of bone only remaining.	Capsule disorganized especially in front. Round lig. gone.		As patient's health failed foot became inverted.
					The lower fragment in front of upper. Fracture along anterior intertrochanteric line. Posteriorly a large fragment had been detached, including the lesser and ⅔ of greater trochanter; some comminution	
						Shortening not overcome by extension.
1						
1						
			Neck of femur fractured close to ball of bone, the plane of fracture at right angles to long axis of neck. Round ligament entire	Capsular and ileo-femoral ligament entire.		External rotation caused great pain. Plaster applied. Result. No inversion. No eversion. No shortening.
			No details of autopsy.	No details of autopsy.		
1						
1						
1						
						Great troch. 4 fingers' higher than it ought to be. Ext. rotation no resistance.
		1			Trochanter major dislocated upward and backward after fracture and united to shaft of bone imperfectly.	
			"Double oblique" fracture of head and neck. Periosteum not torn below.	Capsule intact.		Could raise heel from bed. Motion aggravates pain in hip. Abduction and adduction possible.
				Synovial membrane uninjured.	1. Great and lesser trochanters are both completely detached from shaft. 2. Neck is fractured obliquely downwards and outwards. 3. Six or seven fragments including all pieces	Slight movement caused great pain. After a few days limb became everted with increased shortening.
		1			The epiphysis of thigh broken into 3 fragments. 1. External fragment represented the large posterior aspect of trochanter major 2nd represented head of bone, most of the epiphysis and trochanter minor. 3rd fragment was the anterior fragment of trochanter major.	"Limb could not be rotated outward, only as far as straight position."
					1. Neck broken across its root. 2. Posterior part of trochanter also broken off (presumably great trochanter). 3. Trochanter minor detached and drawn upwards and forwards.	
1						Slight passive motility.
1						
13	5					
		44				

CASE 23. Pac. Med. & Surg. J., vol. iv, June, 1870-May, 1871. A. S. Hudson.
CASE 24. Edinb. Med. & Surg. J., vol. xlvi, 1836. George Gulliver.
CASE 25. Dub. Q. J. M. Sc., vol. x, 1850. Philip Bevan.
CASE 26. Clinical and Pathological Observations in India, 1873. J. Fayrer, C. S. I., M. D., F.R.S.E.
CASE 27. } Edinb. Med. J., vol. xl, Part II, 1895. David M. Grieg.
CASE 28. }
CASE 29. The Med. Age, vol. i (Det., Mich.). J. A. Wessinger.
CASE 30. } Science and Art of Surgery, 1873 (Philadelphia). John E. Erichsen.
CASE 31. }
CASE 32. } Lancet (Lond.), 1879, vol. i. William Pirrie.
CASE 33. }
CASE 34. Lond. Med. & Surg. J., vol. i, 1832. Baron Dupuytren.
A practical treatise on fractures, 1838 (London). Edward F. Lonsdale.
CASE 35. } Lond. Med. & Surg. J., vol. i, 1832. Baron Dupuytren.
CASE 36. } Clin. Chir., vol. i, 1839. Dupuytren.
CASE 37. A treatise on diseases of the bones, 1726 (London). John Louis Petit.
CASE 38. Vrtljschr. f. gerichtl. Med., 1904, xxvii. Feldman.
CASE 39. Progrès Méd., Par., 1877, V. Ozenne.
CASE 40. Dub. Med. Pr., 1861. J. H. Powers.
CASE 41. Oesterr. Med. Wochenschr., 1845, No. 18. Linhart.
CASE 42. Principles of Surgery, vol. i, 1838. John Burns (case).
CASE 43. } Ber. d. k. k. Krankenh. Wieden für 1874, Vienna, 1875. Mosetig von
CASE 44. } Moorhof.

DEPARTMENT OF TECHNIQUE

FRACTURE OF THE FEMUR IN FORCIBLE DELIVERY WITH PRESENTATION OF A SPLINT[1]

By CHARLES R. ROBINS, M. D., Richmond, Virginia
Professor of Gynecology, Medical College of Virginia, and Gynecologist to Memorial Hospital

The possibility of fracture of the femur in the various manipulations of the lower extremities in forcible delivery is referred to in a few of the standard books on obstetrics. So far as I have been able to ascertain, after a somewhat careful investigation conducted by myself and others, this is the most that is given on this condition in medical literature.

It was my misfortune to have this accident happen in a case conducted by myself, and in discussing it with several local physicians I was able to learn of five other cases. When the amount of strain which has frequently to be placed on these small bones is considered, we would readily conclude, what appears to be proven by the very meagre inquiry conducted by myself, that this accident is by no means as infrequent as the slight attention paid to it would indicate. As regards treatment, I have been unable to find any suggestion of any method, and yet the difficulties presented are quite serious.

In the case which I have to report, the presentation was by the breech, the spine lying left anterior. The mother had been in labor two days and had only been able to bring the breech to the lower strait of the pelvis when she became completely exhausted and the pains of no avail. It therefore became necessary to deliver by traction, and I called in my colleague, Dr. D. J. Coleman, professor of obstetrics, who agreed as to the necessity for this step and suggested that as the groin could be reached, that traction should be made by the finger hooked over the anterior groin. While this was being done the femur suddenly snapped. Delivery was completed without further accident than a slight laceration of the perineum.

In the treatment of such a fracture a number of points must be considered. It is absolutely necessary to adopt some method that will permit handling of the child for nursing without disturbing the limb, that will permit changing of napkins, that will not become soiled and that will not excoriate the delicate skin. These indications cannot be met by any of the methods in vogue for treatment in older persons. The following methods were considered and discarded for various reasons:

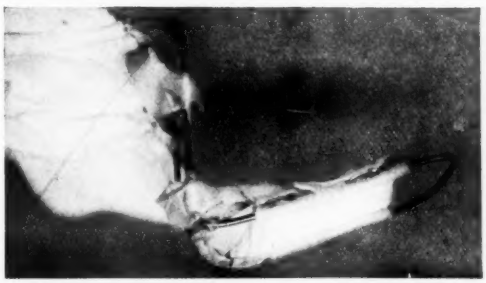


Fig. 1. Splint with binder and hammock attached.

The long lateral splint is not satisfactory even in adults because it does not prevent angulation and shortening. It would be extremely difficult to fix the fragments of the femur encased in soft thick muscles.

The Bradford frame might be used with bands placed to fix the limb, but it holds the limb in extension, which is abnormal in infants and must result, for obvious reasons, in extreme angulation.

Buck's extension cannot be applied to such a small individual, and the child cannot be moved for nursing at the breast.

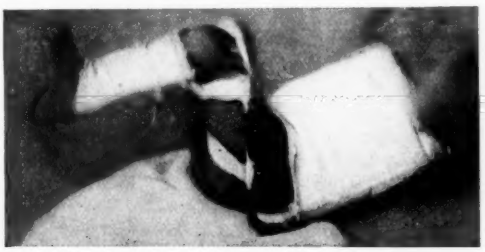


Fig. 2. Splint applied to infant.

[1] Read before the Southern Surgical and Gynecological Association at New Orleans, December 18, 1907.

Fig. 3. X-Ray showing fracture in case reported and splint applied.

Vertical extension would prevent handling or nursing at the breast.

Plaster of Paris is heavy, apt to become soiled, and to excoriate the skin and would be extremely difficult to apply in an infant to produce a satisfactory result.

Some method then to which these objections could not apply and which would meet the various indications became necessary, and the splint which I present and which is the one used in the case reported, was the final result of my efforts. It is simple, easily constructed, and yet I think meets every indication.

It is made of stout wire, such as is used on the street for telephones, and while it can be bent with pliers, is sufficiently rigid to keep its shape. A splint should be constructed for each case so as to conform to the proper measurements. In constructing it, it passes across the back at the level of the lower angle of the scapula, commencing on the sound side. It is then bent to run along the posterior lateral aspect of the body to the great trochanter on the affected side, then bent upward to correspond to the line of the femur, the thigh being bent at little more than right angles to the body, which is the natural position for an infant and which at the same time secures the greatest relaxation of muscles and best apposition of fragments, and then carried to just above the knee, then bent in a horizontal direction and carried about two inches beyond the foot, when it is curved around and brought back on the inner side of the leg in a loop until it reaches the knee, when it is bent outward to pass in front of the sound thigh and to extend to the posterior lateral line of the body just above the anterior superior spine, and then bent along this line and carried to meet the end of wire commencing the splint.

The splint is fixed to the body with a binder of stout canton flannel which is made double at the back so that that portion of the splint may be slipped between the folds. It should fit snugly, and the binder is kept from slipping off the splint by adhesive plaster which adheres to the binder and is continued around the bar of the splint, one on either side. The binder is fastened in front with safety pins. This gives a very firm and satisfactory base for the splint. The leg rests between the bars of the loop bent around it and is supported by a hammock made of canton flannel. This is sewed over the bar on the inner side, the outer side being left free and fixed over the outer bar with small safety pins. The hammock is adjusted so that when the leg is held firmly in it, which is done with a roller bandage, there will be some traction on the femur. When it becomes slack it can be easily tightened and repinned. The up and down motion of the knee can be prevented

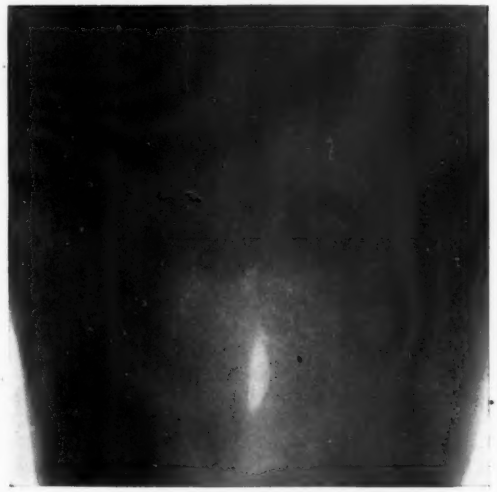


Fig. 4. X-Ray showing result at age of 6 months. The over-riding shown in Fig. 3 was completely reduced and the two limbs are identical.

by bands of adhesive plaster passed before and behind the thigh and attached to the vertical bars of the splint. Coaptation splints are difficult to use and inefficient. In actual practice I found the splint as described light, it did not excoriate the skin or become soiled, the only point of pressure was at the tranverse bar running across the back, and this was prevented by padding with absorbent cotton. The child was easily handled and nursed and was able to take its airing.

The result secured was perfect as regards function, and anatomically without angulation or shortening. A radiograph taken after the splint was applied, showed a slight over-riding but perfect alignment of the femur, and another taken at six months shows a femur without angulation or deformity of any sort.

I was anxious to compare this result with other methods and had radiographs taken of two cases, one of which had received no treatment and the other treated with apparatus. Both showed marked angulation and deformity, although function was excellent in the case treated with apparatus.

RÉSUMÉ OF SOME RECENT LITERATURE OF PUBIOTOMY[1]

By HENRY F. LEWIS, M. D.

HISTORICAL

Gigli, in 1893, after seeing and studying many cases of symphyseotomy, conceived of the lateral incision through the pubic bone as an improvement which obviated many difficulties and dangers of the older operation. Following his ideas, Bonard of Lugano performed such an operation in 1897 without anesthetic and in a mountain hut under most unfavorable auspices, but with excellent results. Calderini of Bologna did a second operation in 1899. Van de Velde of Haarlem performed the third pubiotomy in 1901. The results of both were good. It was not until 1902 that Gigli had his first chance to himself do his own operation. This is the first of a series of 15 cases in Italy which Gigli reports in the *Zentralblatt für Gynekologie* of 1904. Since then Van de Velde has done 2 more, Mayer of Copenhagen 1, Meurer of Amsterdam 1. All of the results were good, every patient left her bed within one month.

Gigli and the Italian obstetricians were not entirely borne out in their enthusiasm for pubiotomy by later reports of the operation done elsewhere in Europe. Everke, in the *Zentralblatt* for 1906, prophesies that hebotomy will soon pass, as did symphyseotomy. In 1900 Baumm of Breslau performed two pubiotomies according to Gigli's open method, with fatal results in both cases. This so disgusted him with the operation that he performed no more until 1905 when he began again, this time following Doederlein's subcutaneous method. Baumm reports 10 cases since the latter date. He had no maternal deaths, but concludes that pubiotomy has not been proven to be an operation to be recommended for general practice, and that if it is to be justified, special skill must be obtainable and employed.

TECHNIQUE

Gigli (Z. f. G., '04, p. 1397) gives his technique of the lateral incision. He says that hebotomy is now so perfected that symphyseotomy is no longer a surgically correct procedure. The only danger of hemorrhage is from the crus of the clitoris, and this usually yields readily to tamponade

[1]Read at the Chicago Gynecological Society, November 15, 1907.

and pressure. There are two important points to be observed: first, the cut must be outside the articulation of the symphysis; second, it must be outside the insertion of the ligamentum pubo-veniculia. It lies entirely in bone instead of fibro-cartilage. The external incision may be guided by the index finger and thumb of the left hand placed respectively above and below the symphysis. The knife passes to the right of these digits. One may cut freely and fearlessly. The blunt needle is inserted behind the bone and passed close to it under the guidance of two fingers in the vagina. The wire saw cuts through the bone, and the operation is finished.

Doederlein (*Archiv für Gynekologie*, B. lxxii) describes his subcutaneous method. A small incision is made over the pubic tubercle on one side, usually the left. A blunt, curved needle of special design is passed along the posterior surface of the bone, guided by a finger passed into the wound. It is passed out through a small counter-opening in the labium majus. The Gigli saw is drawn through and the bone severed. The skin wounds are sutured without drainage. Doederlein recommends the prophylactic insertion of the saw in cases of narrow pelvis where the outcome is uncertain, especially in breech cases and those where version is likely to be required. The subpubic ligament must be cut in order to get sufficient parting of the ends of the bones.

Sellheim says that in Doederlein's method ocular inspection and exact hemostasis are sacrificed. In each case there is considerable hemorrhage from the ends of the bones and there is usually a hematoma of the labium.

Leopold and Kannengieser (Z. f. G., '04) report 5 cases. The first was by Gigli's open method and the last 4 by Doederlein's. All mothers had a quick and normal recovery. Leopold concludes favorably to the operation.

Walcher and Bumm puncture the skin with the needle and pass it without the guidance of the finger, as Doederlein does, but with a finger in the vagina.

Baumm, on the basis of his 10 cases, concludes that Doederlein's subcutaneous method renders the open method of Gigli obsolete.

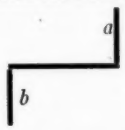
Of 294 cases collected from the literature by Doederlein (1906 Congress German Gynecological Society) 77 were treated by the open method. These had a maternal mortality of 10 per cent. The remainder were treated by the subcutaneous operation and showed a mortality of 4 per cent. Deaths were from infection, thrombosis, and hemorrhage.

Reifferscheid describes a fatal case of wounding the bladder by means of the needle. Henkel recommends stripping up the posterior periosteum before passing the needle.

Several authors propose or practice methods of keeping the pelvic girdle enlarged permanently after the operation so that future labors may be easier. It is well known that this is the rule in symphyseotomy, indeed, this is one point that is often used as a reason against the operation. Since few observers prove that there is a bony union even in pubiotomy and nearly all who have studied that point state that there is a space between the bony ends filled with fibrous tissue, it would seem that the operation done in the customary manner provides for a permanent enlargement of the pelvis. Credé proposes a pelvio-plastic operation which places a piece of the bony pelvis between the divided ends of the bone. (Z. f. G., '06, No. 22.) The skin is opened by an incision of semicircular shape passing from the right pubic tubercle across the hypogastrium to the middle of the horizontal ramus of the pubes on the left. The skin is turned down to expose the bone. The wire saw is passed first in the Gigli manner. Then it is passed into the obturator foramen, and that aperture is joined to the first bony incision by the saw. From the point where the saw entered the obturator foramen it is again passed to a point on the upper surface of the horizontal ramus two centimeters to the left of the original bony incision. Thus a square piece of bone is separated from the pubic structure. This is pushed down between the separated ends of the lower portion of the pubes, to be allowed to grow there and increase the caliber of the pelvis by so much.

Truzzi and Wendeler propose to introduce foreign substances, such as magnesium or ivory, into the space between the bones (Z. f. G., '06, No. 37, and '07, No. 21).

Hammerschlag proposed to introduce a piece of bone and periosteum from the tibia into the cleft between the bone ends (Z. f. G., '07, No. 24). Schikeles (Z. f. G., '07, No. 24) makes a triple cut in the bone and unites the ends *a* and *b*.



RELATION TO SYMPHYSEOTOMY

Sarwey collected statistics comparing hebotomy, symphyseotomy, Cæsarean section, and premature artificial labor, with the following results:

Hebotomy on a basis of 120 cases had a maternal mortality of 2.5%

Symphyseotomy on a basis of 210 cases had a maternal mortality of 12.8%
Cæsarean section on a basis of 207 cases had a maternal mortality of 6.3%
Artificial premature labor on a basis of 2,200 cases had a maternal mortality of 1.4%

Doederlein concludes that hebotomy has enough advantages to be preferred to symphyseotomy, holding that the usual hematoma of the vulva in the former rarely has serious results.

Sellheim (Monatsschrift für Geburtshilfe und Gynekologie, '06) gives a résumé of his own clinical and experimental studies of hebotomy and symphyseotomy. He finds the same safety of the sacro-iliac joints in both. The former fear that excessive separation of the symphysis might cause injury to the sacro-iliac synchondroses has been proved ungrounded. Sellheim found that no damage came to these structures unless the anterior ligaments were divided, and no possible force in nature could tear these ligaments asunder. There was the same permanent opening between the divided extremities of the pubes in both, because in all cases in his experiments the union was only fibrous.

E. P. Davis had an experience of 8 cases of symphyseotomy. He concludes that the results are less favorable for mother and child than those of Cæsarean section. From his studies of the literature of symphyseotomy and pubiotomy he has not been led to perform the latter.

Gigli states that in Pestalozza's clinic in Florence, where symphyseotomy and hebotomy were done contemporaneously, the results of the former operation were uniformly worse than the latter. They had a longer convalescence, while the latter healed with ease. Symphyseotomy is an operation on a joint, a pubic arthotomy done during labor. Gigli has the temerity to compare such an operation with an operation upon such a joint as the knee. Indeed, throughout all of Gigli's writings and those of the Italians in general there is such a marked partisanship displayed that their conclusions as to pubiotomy and its relative value must be taken cum grano salis.

Frey performed 3 symphyseotomies and 5 hebotomies at Mühlhausen. The results may be tabulated as follows:

1. Symphyseotomy, no laceration of consequence.
2. Symphyseotomy, urethra torn across.
3. Symphyseotomy, much hemorrhage; perfect final result.
4. Hebotomy (open), large tear of anterior vagina, causing complete incontinence.
5. Hebotomy (open), perfect result.
6. Hebotomy (subcutaneous), insufficient opening of the bones, child dead, anterior vaginal tear, recovery.
7. Hebotomy (subcutaneous), perfect results.
8. Hebotomy (subcutaneous), insufficient opening of bones, living child, good final result.

Schauta became a convert to the Gigli operation. He states that the main advantage of hebotomy over symphyseotomy is the avoidance of extensive wounds of the soft parts. His optimism in regard to the Italian operation is not well borne out by numerous reports of extensive lacerations following it.

Zweifel in Germany has always been the strongest advocate of symphyseotomy. Up to 1899 he had 35 cases without maternal death. In the next 11 he had 4 maternal deaths. In the whole series he had only 4 deaths of the children.

DANGERS

Abel's work in symphyseotomy shows that the healing process of the soft parts has a greater influence upon the result than the condition of the wound in the fibro-cartilage (A. f. G., B. lviii). Doederlein reports a penetrating vaginal tear. Sitzenfrey in Prague reports two perforating lacerations of the vagina in 7 cases. Hohlweg in Kiel reports two perforating vaginal wounds, in one of which the patient died as a result. Kannengieser had 6 extensive vaginal wounds in 21 cases. Reifferscheid, Bumm. Semmelink, and Pfannenstiel had prolapse of the vagina into the space between the bones. Rühl describes the worst bladder wound. This occurred in a iipara. The bladder and vagina were completely torn and everted. Most authors report brisk hemorrhage as the bone is separated. Usually the hemorrhage can be stopped readily by tamponade and counter-pressure within the vagina. In almost every case there is more or less of a hematoma of the vulva.

Hernia can occur through the split in the bone without lesion of any part of the belly wall. Mann reports 2 such cases (Z. f.G., p. 1283). The dangers of tears are greatest in primiparæ in whom the operation is most likely to be indicated if ever. Rosthorn had a death from hemorrhage beginning as the bones separated.

Rühle proved pretty conclusively from his 4 cases that severe bladder and vaginal wounds can occur as readily in hebotomy as in symphyseotomy.

SUMMARY

Relatively few cases of pubiotomy were done up to the last four or five years. Then came in the modified Doederlein operation; since then obstetri-

cians have been trying pubiotomy. The results as regards the death of the mother are about twice as good as for symphyseotomy, but we must bear in mind that most surgical results have been better the past five years than the ten years before that. Symphyseotomy came in when asepsis and general technique were not so good as now, so that a part of the good record of pubiotomy is probably due to better surgery. So that the conclusion I have personally reached in the study of the literature I have made is that there is very little difference in the good results and very little difference in the bad results of the two operations. To be said in favor of symphyseotomy, it is much easier done, does not require the technique, can be done with a blunt-pointed bistoury (and one is not apt to have the saw, Doederlein needle, etc., with him). On the other hand, I think the future of any pelvic-widening operation is not bright. The Cæsarean section mortality is falling year by year, and that operation will take the place of pubiotomy and symphyseotomy in all cases where the patient is seen early, that is, in all cases where we have the assurance of asepsis.

On the other hand, where we are going to open a bone in the performance of pubiotomy in the presence of wounds in the vagina and cervix, in the presence of the immense danger of sepsis there, where we are going to get a compound fracture, or in symphyseotomy where we are going to wound cartilage, which has a worse nutrition than bone, — in both these cases we are opening into something we do not want to get infected, any more than we would want a Cæsarean section infected. While the immediate results would not be so bad, yet the danger of death would be considerable, and the danger of long convalescence for the mother would be great in both. I think the indications for both symphyseotomy and pubiotomy will become narrower and narrower as time goes on. In individual cases the decision will be between Cæsarean section and perforation, rather than between symphyseotomy and pubiotomy.

LITERATURE

Sellheim; Monat. f. G. u. G., '06, p. 362.
Truzzi and Wendeler; Zentralb. f. G., '06, No. 37, and '07, No. 21.
Hammerschlag; Z. f. G., '07, No. 24.
Schikeles; Z. f. G., '07, No. 24.
Credé; Z. f. G., '06, No. 22.
Leopold; Z. f. G., '04.
Doederlein; Arch. f. Gyn., B. lxxii.
Gigli; Z. f. G., '04, p. 1397 and 281.
Doederlein; Z. f. G., '04, No. 42
Sitzenfrey; Z. f. G., '05, No. 41.
Hohlweg; Z. f. G., '05, No. 42.
Pfannenstiel; Monat. f. G. u. G., B. 24, h. 3.
Rühl; Monat. f. G. u. G., B. 24, h. 3.
Sellheim; Z. f. G., '05, No. 36, abs. S. G. &. C., vol. i, p. 468.
Davis, E. P.; J. A. M., Oct. 19, '07.
Henkel; Zeit. f. G. u. G., b. lvii.
Frey; Monat. f. G. u. G., Sept. '07.
Leopold; Z. f. G., '04, No. 46.
Mann; Z. f. G., '07, No. 44.
Offergeld; Monat. f. G. u. G., B. xxvi, h. i.
Ferroni; Z. f. G., '04, No. 36.
Rühle; Arch. f. G., B. lxxxii.
Everke; Z. f. G., '06, No. 44.
Walcher; Z. f. G., '05, No. 36 and 48.
Kannengieser; Arch. f. G., B. lxxviii.
Reifferscheid; Z. f. G., '05, No. 42, and '06, No. 48.
Bumm; Z. f. G., '06, No. 32.
Semmelink; Z. f. G., '06, No. 48.
Stöckel; Z. f. G., '06, No. 3.
Rosthorn; Monat. f. G. u. G., B. 24, h. 3.
Bauereisen; Münch. med. Wochen., '05, No. 52.

PRELIMINARY AND AFTER TREATMENT OF ABDOMINAL SECTION[1]

A Report upon One Hundred and Fifty Consecutive Cases of Abdominal Section without a Death

By JOHN M. WITHROW, A. M., M. D., Cincinnati, Ohio
Gynecologist to Christ and Cincinnati City Hospitals. Professor of Clinical Gynecology, Miami Medical College

The preparation of patients for abdominal surgery should always be considered seriously, no matter how trivial the condition for which the operation is proposed. While recent surgical triumphs have marvelously minimized the mortality in opening the peritoneal cavity, it is still certain that every such procedure, for whatever cause, puts life in some jeopardy, the relative amount of danger, of course, depending upon the conditions for which surgery is proposed.

As a routine the urine should be carefully examined and measured, and in doubtful cases the blood should be counted. The alimentary canal should be fairly emptied, and the skin washed out as well as cleansed externally. We give all our patients sufficient laxatives to produce soft but not watery stools for one or two days before operation. For this purpose licorice powder or castor oil, followed by enemeta, are sufficient as a rule. The old time copious purgation has been abandoned, and salines are no longer employed. The patient is let absolutely alone during the night before operation. A night's rest is more important than so much fussy treatment as will frighten the patient and drive away her confidence, by giving an exaggerated impression of danger.

A final enema is always given from one to three hours before operation. Food is given freely as a rule, up to and including the noon meal of the day before the operation. Supper of this day is confined to fluids. Water is given freely for two days before operation — a half pint every two, three, or four hours in addition to fluids at meals. This is to wash out the skin and kidneys and stimulate the bowels. It is also useful in keeping the blood-vessels full. The patient is given a thorough soaking bath the day before, and a sponge bath the morning of operation. She does not take to her bed till after the midday meal before operation. After the thorough bath, the abdomen is thoroughly shaved and scrubbed with brush and soap, afterwards cleansed off with 70 per cent alcohol, and a compress wet with one to two thousand bichloride is bound on and worn over night. The vagina is always sterilized by soap and water washing; followed by 70 per cent alcohol, and a one to two thousand bichloride douche. On the morning of operation a final examination of the urine is sent to the operating room.

All patients are anesthetized in a room adjoining the operating room. The anesthetic is never started until everything is ready and hand sterilization has commenced by all connected with the operation. Sterilized gowns, caps, masks, and rubber gloves are worn by all.

Hand sterilization is secured by brush, soap, and water for fifteen minutes, followed by 70 per cent alcohol and one to one thousand bichloride, with emphasis on and faith in the soap, water, and brush.

After the patient is on the operating table, a final rapid sterilization of the field of operation is done, by washing with soap and water at a temperture of 100, this being washed off with 70 per cent alcohol and followed by a one to one thousand bichloride solution. This sterilization is done with as little wetting as possible and confined to the field of operation. The body is kept well covered elsewhere, and a sterile mattress is used on the table.

Anesthetic. Ether is used by preference, always by the *very* open cone or the "drop method." If the cone is well open and the ether dropped on a small portion of gauze, I see very little difference between it and the drop method. No nitrous-oxide gas or ethylchloride has been used as a preliminary to the ether or chloroform. I am afraid of both and believe that there have been more deaths per anesthetic minute from the nitrous-oxide than from any other anesthetic. Chloroform is given only when ether seems contra-indicated by lung or kidney complications or in the very old or infirm. The anesthetist is constantly cautioned to give the least possible of the drug to secure the needed relaxation and insensibility to pain. The patient should be conscious in a few minutes after the operation is over. If she is not, too much has been given or it has been given too long. I have had no experience with spinal anesthesia, morphine-scopalamine or other combinations, and am not likely to have.

Heart Stimulation. In not one of these cases was alcohol in any form used for heart stimulation.

[1] Read before Cincinnati Academy of Medicine, October 21, 1907

Strychnia hypodermically in 1/30 grain doses was used in 15 of the cases. Normal salt solution was introduced into the vein in 10, and by subcutaneous infiltration in 6. No other form of heart stimulation was employed.

Drainage. With the exception of the gallstone cases and the cases of appendiceal abscess, abdominal drainage has only been used in four instances. Two of these were cases of very foul putrefaction associated with ectopic gestation.

These two cases were the most desperate of the type that I have ever encountered. In one, death of the fetus at four months had occurred ten months prior to operation. It was a case of abdominal pregnancy. The placenta was attached to coils of intestine, to right of and just below the umbilicus. The patient had a low grade of sepsis for the four weeks previous to operation. A mistake in diagnosis was made, because the patient had forgotten that she had missed four periods a year before. The diagnosis at time of operation was pyosalpinx. The fetus was found completely macerated, and was the foulest smelling matter I ever encountered in a living being. The sac and bones and other debris were hastily removed, and the partially putrid placenta was left attached to the intestines. A large drainage tube was carried from this mass through the abdominal incision, and another tube, from the same neighborhood, was carried into the vagina through Douglas's fossia.

The other case, No. 23, was a putrid fetus in the pelvis, for the most part, which was similarly drained. Diagnosis, however, was correctly made in this case. Both of these cases had a hard fight, but both recovered.

In one case a very large sarcoma of the ovary extended into the abdominal wall in the left iliac region, and a large space was left bare of peritoneum. Peritoneum was stitched over it, and a stab wound drainage was established into the pocket thus formed, by means of a rubber tube.

In another case a pus tube was densely adherent to the abdominal wall, to the left side just above Poupart's ligament. The peritoneum was removed for considerable distance and the omentum was brought down and sewed over to cover the breach. This was also treated by stab wound drainage just above Poupart's ligament. There was not the slightest infection in either case, and both have made splendid recoveries. Vaginal drainage was established in 11 of the cases.

Hernia. Most of these cases have been followed, and hernia has occurred, so far as information has been obtained, in but one case. Dr. Robinson of this city operated on it a month ago and reports that there were practically no adhesions of either omentum or intestines to the abdominal wall. This is most remarkable when the desperate character of the putrefactive placenta is considered. I do not believe that hernia under the method of closure employed will ever occur when infection does not take place.

After Treatment. The surgeon himself should personally direct the entire management of the case and should visit every patient daily or oftener during the convalescence. His presence must always be a source of comfort and the inspiration of needed confidence. As a rule, no after treatment is needed if the operation has been well and cleanly done. On general principles a policy of non-intervention is followed. There is no established routine. It takes great courage to let a patient alone and let her get well in peace.

Nausea and Vomiting. Washing out the stomach at the close of operation has been tried without satisfactory results and abandoned. The best preventive is the use of the least possible anesthetic. When patients are deluged with ether, they vomit frightfully; if they are barely kept under, vomiting usually occurs once or twice just as consciousness is returning, if at all, and not much afterward. The second and third day nausea of chloroform is best met by washing out the stomach and the giving of food in small quantities. I am skeptical of the value of drugs for the vomiting or nausea and never give them now. Nausea and vomiting must logically be regarded as symptoms, and prevention and relief must be directed to their causes.

1. The initial vomiting is due to direct irritation of stomach by mucus swallowed during inhalation. This is saturated with the anesthetic and is usually ejected with the first return of consciousness. It contains also the gastric secretion provoked by irritation, together with some bile in most cases. Theoretically, it ought to be washed out at the end of anesthesia, but washing at such time endangers the trachea more than the conscious vomiting fifteen to thirty minutes later.

2. The nausea, which occurs one, two or three days after, is due to central irritation. This is mostly after chloroform and is relieved by small quantities of food.

3. Nausea and vomiting, caused by renal insufficiency, for which normal salt solution by bowel, hypodermidoclysis or intravenous injection in large quantities, is indicated, together with skin, stimulation by hot-packs.

4. Nausea and vomiting due to sepsis. *a.* By intestinal distention, causing regurgitation of intestinal contents into stomach. *b.* The central

irritation of septic intoxication. The first is best relieved by enemeta containing turpentine and possibly by giving such purgatives as colocynth, although I have had no experience with the latter in several years. The second form of septic vomiting is only relieved by the control of the sepsis, for which I know of no satisfactory method. Antistreptococcic serum and alcohol are given, but neither has great or clearly demonstrated value.

Decubitus. The patient is usually put flat on her back with a low pillow and well wrapped in blankets, with hot water bottles. These are removed as soon as the rectal temperature reaches normal, and heavy bed-clothing is taken off at the same time. It is a great blunder to keep patients swaddled and sweating after they have reached a normal temperature. It is an enervating and depressing custom and does great harm. Old or infirm patients are put in the Fowler position or somewhere between it and the horizontal at once. This position in moderation is used also in cases when vaginal drainage is employed. All cases are turned from side to side, as they may wish. It is a great comfort to patients to have pillows under the shoulders and head, and these are always allowed. The knees are propped up also. This relaxes tension of the abdominal muscles and adds greatly to comfort. In general, the nurse is told to rub the back or shoulders, or make such local pressure as will give real or fancied comfort.

Water. Normal salt solution is given by bowel — seven or eight ounces at a time — as soon as it can be retained, and repeated every two or three hours until the patient can take water freely by the mouth. Water is given either hot or cold as soon as vomiting is well over. This will usually be in three or six hours, if the anesthetic has been properly given. The patient's taste or experience determines whether the water shall be hot or cold, and experience must determine the amount. Usually we let them begin with a half ounce every half hour, and increase as may be indicated.

The patient is allowed to rinse the mouth with cold water as soon and as often as she wishes.

Pain. Most patients suffer pain, but not all. The cases reported here had sufficient pain to require drug relief in about 80 per cent of the whole number, that is, one in five did not need anything for the control of pain. No routine method of treating this symptom has, therefore, been indicated. It seems unwise to give morphine with the anesthetic, or just after, because only four out of five need it. When pain occurs in such amount as to cause restlessness, overnervousness or sleeplessness, an anodyne is given, otherwise not.

If pain is moderate, two grains of phosphate of codeia are given with twenty grains of chloral hydrate in four ounces of water by rectum.

Sometimes where sleeplessness is not a factor and the pain is not very severe, codeia is given alone hypodermically, a half grain at a dose. If pain is severe, morphine is given hypodermically in quarter grain doses. Rest and freedom from pain are more valuable than the morphine is harmful.

Bowels. We have no routine treatment for the intestinal canal. The bowels are let alone, unless conditions indicate treatment. The internes and nurses are instructed to watch the upper edge of the bandage and look for any distention of the transverse colon. If it becomes at all marked, the patient is given a simple enema, containing two drachms of turpentine. If this is insufficient to produce the relief of distention, a high enema, consisting of four ounces of glycerine, four ounces of castor-oil, two drachms of turpentine, and a pint and a half of water is given high and slowly. If there is no distention, the bowels are left alone absolutely until the third or fourth day, when, if they do not move spontaneously, a simple enema is given. When patients complain of a sticky mouth and have a pasty or coated tongue at any time in convalescence, calomel, a half grain every half hour, for from three to six doses is given and followed by a simple enema or half bottle of citrate of magnesia. I am persuaded from careful observation that most of the trouble, arising from intestinal paresis, paralysis, or distention from whatever cause, is due to varying degrees of sepsis.

Much of this sepsis, it seems to me, is due to rapid and overvigorous manipulation of the bowels and peritoneum in the separation of adhesions. I fear that the desire to do a rapid or a brilliant operation is at the bottom, oftentimes, of the real or fancied demand for vigorous purgation, as indicated by intestinal distention. The operator who watches the clock or spectators while dealing with abdominal cavities, will meet more intestinal distention in the aftermath than the one who is oblivious to both. It is also true that the patient and careful covering of all exposed surfaces and stumps with peritoneum is a great preventive of trouble with the bowels.

When this is done, the argument that vigorous purgation will prevent subsequent adhesions need not be offered.

Bronchial Tubes. It is not questioned that ether is considered an irritant to bronchial tubes, and in many cases seems to provoke a mild bronchitis and sometimes a pneumonia in the convalescence, and chloroform is by no means free from the same possibility. The best relief for this

difficulty is its prevention by the lightest possible anesthesia. When it arises, the patient should be put in as near a sitting posture as possible and the chest covered with the emplastrum kaolini.

I do not know that drugs are of much avail in relieving this form of bronchitis, although we give codeia and iodide of ammonia occasionally. In one case of this series an ether pneumonia of mild type was developed, but did not interfere with the recovery. There were 8 cases of ether bronchitis and (strange to relate) 4 of these occurred in the last 10 cases. The bronchitis, however, has not in any way interfered with recovery.

Renal Complications. Renal complications in varying degrees are frequently the cause of great difficulty of convalescence. The modern practice of free use of water by mouth before operation, occasionally in the peritoneum during operation, and by rectum, vein and skin after operation, has very materially lessened the extent of these difficulties. It is well known that ether and chloroform anesthesia is often followed by changes in the urine. Kelly found casts in the urine in 15 per cent of the cases after operation. Wunderlich found casts in 24.6 per cent of cases following ether and 34.8 per cent of cases following chloroform. It is uncertain whether this is due to the anesthetic or to the waste products surcharging the kidney, incident to operation. At any rate the indication is clear to give the least possible anesthetic and secure the most rapid possible elimination by hydrotherapy, as before outlined.

As has been previously pointed out, nausea and vomiting sometimes develop as a consequence of renal insufficiency, and I am inclined to the belief that cases of acute dilatation of the stomach, which occasionally develop, are caused by deficient kidney elimination. In addition to the use of water in the manner just mentioned, saline catharsis is unquestionably indicated. I have never had satisfactory experience with any form of drug diuresis. The methods outlined, as mentioned, are more prompt, positive, and rational. The stomach, as a rule, is out of commission at such times, and drug administration is likely to make trouble. The ureter is sometimes cut, tied, or burned during pelvic operations, but no trouble of this kind was encountered in this series. Pyelitis, mostly due to the use of the catheter, has also been escaped in this record.

Uremic Amaurosis. Uremic amaurosis developed in Case No. 57, from whom a four-pound multilocular cyst of the ovary was removed, together with the appendix, and a uterine myoma as large as a goose egg was removed by myomectomy. The patient had passed no urine at nine o'clock the next morning, when she was absolutely blind so far as distinguishing objects was concerned. She could only detect light. She was immediately put in a hot-pack, given normal salt solution subcutaneously and perspiration established. Urine was passed in the afternoon of the second day. It was loaded with albumin and had some casts. The secretion of urine was normal in amount afterward, and she was able to distinguish objects in four days and vision was perfect in two weeks. Albumin and casts gradually lessened and wholly disappeared in ten days. This is the only case that I have ever encountered, and was doubtless due to the anuria.

Food. Patients are given a liquid diet as soon as possible, that is, usually by the afternoon of the second day. This fluid diet is, for the most part, albumen water, animal broths, and butter-milk. Sweet milk is not usually given. I do not believe that it generally agrees with patients just after operation. During the second or third day patients are allowed to have light diet of eggs, toast, and cereals. The third or fourth day, general diet after the bowels have moved. Generally speaking, patients are not urged to eat, but allowed any reasonable diet desired. There is no fear of their starving to death, and food will not be of much value until they want it. We have found it very useful and agreeable to let patients have chewing gum, if the mouth is sticky and pasty and there is repugnance to food. If you have never tried it, you will be agreeably surprised at the comfort it often gives.

Wound Infection. It is a great pleasure to report that in addition to the 2 cases with abdominal drainage, only 2 others in this series had any wound infection. One of these was a total extirpation of uterus, and the other was a pus tube.

The aponeurosis is always brought together by a running suture of silk-worm gut which enters the abdominal wall about one-half inch above the upper end of incision and emerges a half inch below the lower end. This is buttoned and shotted tight, and is not removed until the patient is ready to leave the hospital. The skin and fat, when necessary, are brought together with subcutaneous silk-worm gut sutures. These are removed on the eighth or ninth day.

No other suture material than catgut has been used in any other part of the abdomen. Chromicized catgut was used only in the ligation of the appendix and in the few cases where it was necessary to repair damage done to the intestines. Silk was not used at all.

Dynamic Ileus. Acute Dilatation of Stomach. Thrombosis and Embolism. Dynamic Ileus, acute dilatation of the stomach, and thrombosis and embolism are occasional unfortunate sequelæ of surgical operations, which have not been encountered in this series of cases. Indeed I have never seen the two former and never met but one case of thrombosis, which attacked the patient as she was putting on her clothes to leave the hospital many years ago. It was thrombosis of the right lung and caused her death in twelve hours. Logical conception of these conditions would probably class acute dilatation of the stomach as a sequel of renal insufficiency and dynamic ileus and thrombosis and embolism as manifestations of sepsis.

Secondary Hemorrhage. In this series there was one case of secondary hemorrhage. It was a desperate situation in which sarcoma of each ovary was removed. On the left side there was a deep adhesion in the pelvis. This did not bleed at the time of operation. Hemorrhage was announced by internes four hours later, and a few minutes afterward under anesthesia I reopened the abdomen and quilted over the bleeding area with catgut. The patient made an easy recovery, and although it is seven months since the operation, there is no evidence of recurrence of sarcoma, as I have just examined her.

Time in Bed. I have had no experience in letting patients out of bed during the first, second, or third day. As has been stated, they are allowed to sit up, or rather to be propped up, in certain conditions immediately after operation. I am dreadfully afraid of the catheter and allow patients to be lifted on to the commode to pass urine even as early as the second or third day, if it is necessary for voluntary micturition. Ordinary cases sit up in bed on the fifth or sixth day, and sit out on the seventh or eighth, leaving the hospital from the sixteenth to twenty-first day. No patient has left earlier than the twelfth day. I see no reason to change this practice and am not in sympathy with the practice of those who get patients out of bed on the second, third, or fourth days. It has never seemed sufficiently attractive or expedient for trial at our hands.

Bandage. While I doubt its necessity under the method of suturing employed, I still adhere to the custom of having each patient wear an abdominal bandage for at least three months after operation, although it is probably not necessary as a preventive of hernia. It unquestionably is useful in the comfort of support which the patients secure from its use.

1.	Ovarian tumors	Cystoma	14
		Sarcoma	2
		Papilliferous	2
		Hematoma	3
		Dermoid	2
2.	Adherent and diseased ovaries		3
3.	Pyosalpinx		40
4.	Tubercular salpingitis		1
5.	Hydrosalpinx profluens		1
6.	Ectopic gestation		7
7.	Hysterectomies for	Fibroids	27
		Carcinoma	3
		Myomectomy	1
8.	Retroflexion of uterus		13
9.	Ventral fixation		1
10.	Intraligamentous cysts		1
11.	Gallstones	Bladder and cyst duct 1	
		Common duct 3	4
12.	Intestinal adhesions		1
13.	Appendicitis		15
14.	Tubercular peritonitis		1
15.	Ventral hernia		3
16.	Abdominal fistula to intestine		1
17.	Exploratory		4
	Total		150

The accompanying table reports in detail the 150 consecutive abdominal sections without a death. Twenty-eight additional operations were performed on the 147 patients. No case has been declined in which operation seemed at all indicated.

All of the patients operated on in this series are living except two. One of these was a desperate papilliferous cyst of the ovary, Case No. 45. She died in fifty-six days after operation, apparently from obstruction of the bowels. Case No. 94, a double sarcoma of the ovary, died five months after operation, apparently from general extension of the disease to the abdominal cavity. Case No. 29, one of the four exploratory sections, is probably dead. The section was made six months ago, and it was found to be an inoperable sarcoma which had apparently originated in the ovary and spread to the general peritoneal cavity.

Dr. F. F. Simpson, in a recent report to the College of Physicians of Philadelphia, estimates that there were 75,000 abdominal sections done in hospitals in the United States in a year. The mortality varied from 1½ per cent to 24½ per cent.

I take pleasure in recording my appreciation of the assistance of Dr. F. B. Samson, who has been my assistant in a majority of these cases, and has been of very great service in keeping up the records and making the pathological reports.

EDITORIALS

SURGERY, GYNECOLOGY AND OBSTETRICS

EDITORIAL AND PUBLICATION OFFICES
103 STATE STREET . . CHICAGO, U. S. A.

FOREIGN OFFICES
125 STRAND . . LONDON, W. C., ENGLAND

SUBSCRIPTION, PER ANNUM, IN ADVANCE
United States and Canada $5.00
Foreign Countries . . . $6.00 (25 Shillings)

Managing Editor . FRANKLIN H. MARTIN, M.D.
Associate Editor . . ALLEN B. KANAVEL, M.D.

FEBRUARY, 1908

THE IRREDUCIBLE MINIMUM

A recent German publication has tabulated a series of statistics relating to the operation of hysterectomy, collected from various well-known clinics. The mortality varied from five to fourteen per cent, the average being, for the entire series, which numbered several hundred, about eight per cent. Such results cannot be regarded as creditable to modern surgery, and call for some critical remarks. If operators of recognized position furnish such statistics, what must be expected from the host of unskilled tyros who are practicing surgery in all civilized countries? That a high death-rate should follow the work of the latter class is not remarkable. It is, however, surprising that experts, holding distinguished positions, should furnish such records. Are these mortality percentages the lowest possible? Do they represent the attainment of the irreducible minimum? Emphatically not.

In various countries operators are at work whose results are decidedly better than those to which I have referred. How are these differences to be explained? Careful observation of operators and their methods furnishes the answer.

The term "aseptic surgery" has come to be regarded, in the minds of many, as a kind o mascot, which is supposed to permit operative procedures to be carried out on the human body, under any circumstances, without let or hindrance. The fascination of exhibiting manipulative dexterity too often destroys the sense of proportion, and makes the operator oblivious to other considerations. It is, therefore, easy to understand why there may often be found a tendency to neglect conditions which might be contra-indications to surgical procedures, or might lead to a modification of them. In pre-Listerian days, there was some excuse for the concentration of the surgeon's attention on the mechanics of surgery; in the present era, much more is required of him.

The careless use of anæsthetics is responsible for an unnecessary number of deaths, both immediate and indirect. It is very easy to fall into a routine administration, neglecting to give careful individual consideration to the proper selection and use of an anæsthetic, or to exercise supervision over the anæsthetiser. In many serious cases, a fatal issue may result from the use of chloroform or ether, which might be avoided by the use of nitrous oxide gas, or local anesthesia, for example.

The administration of anæsthetics is too often left to those who have had no special instruction in the art, a prevailing opinion being that no special preparation or fitness is required. Too strong a protest cannot be raised against such practice. The greatest degree of safety and efficiency is obtained only when the

anæsthetiser combines thorough knowledge with practical experience.

But it is to the actual work in the operating-room that the writer desires to call special attention. In the pre-Listerian days, the surgeon concerned himself only with the mechanical details of his operation. Knowing nothing of the causes of wound infection, though full of dread with regard to its occurrence, his chief object was to perform his work with speed and dexterity. Under modern conditions, the manipulations of the operator are but part of a series of performances, each of which is of the greatest importance in determining the outcome of surgical work.

The sterilization of instruments and dressings, the preparation of saline material, the cleansing of hands, and many other details of operating-room work, require constant supervision and scrutiny. Too often is this necessary oversight lacking on the part of operators, with the result that faults and imperfections creep into the system of technic, and remain there.

Modern technic is very simple in theory, but its practical details are elaborate, and cannot be disregarded by the successful operator. He should insist upon the methodic training of the hands and eyes of his assistants and nurses, so that the habit of working with precision may be acquired. Perfection in work, whether of the individual or of associates, is usually automatic and without conscious effort. Yet this standard is reached only after a long period of training, the minutest details being often repeated, in the early stages, with conscious effort, guided by an active intelligence. It is only gradually that the habit is acquired of acting without special attention. Unless this method of education be pursued, bad habits are certain to be formed, so that the operator or his staff, in crises or emergencies, or even in ordinary circumstances, may easily deviate from the proper line of action, and commit more or less serious errors in technic. Yet, in the surgical world, comparatively few have subjected themselves to this rigorous training.

A knowledge of the most important facts in bacteriology is essential to the greatest success, and it is advisable that this information should be gained by practical work in a bacteriologic laboratory. The censorship of the latter should always be welcomed by the operating-room, for by this alone can the failures in aseptic technic be determined.

The limitation of our knowledge, and other considerations, may place absolute perfection in surgical work beyond our reach, but it is certain that the irreducible minimum of fatality in surgical work may be brought considerably nearer to the vanishing point, if operators give as much attention to bacteriology, physiology, self-discipline and team-training, as they do to the mechanics of their craft.

J. Clarence Webster.

ANÆSTHESIA PARALYSIS

By anæsthesia paralysis is meant that form of paralysis which follows and is dependent upon the administration of a general anæsthetic. Büdinger,[1] one of the first to describe this condition, gave to it the name of narcosis paralysis, and believed it to be peculiar to chloroform narcosis. He recognized two varieties, a peripheral and a central; the former, involving mostly the muscles supplied by the brachial plexus, he attributed to compression of the cords of the plexus between the clavicle and the first rib. He was able to show that this compression is brought about by displacing the arm upwards and backwards over the head. The mechanism of this compression, as described by Büdinger, shows the clavicle first drawn upwards, bringing it in close contact with the first rib, at the point where the trunks

[1] Arch. f Klin. Chir., Bd. 47.

of the brachial plexus cross the first rib. Extreme abduction of the arms also brings about a rotation of the clavicle upon its transverse axis, causing the sharp posterior-superior border to become the inferior-posterior, and thus further limits the space between the two bones, and compresses all of the cords, but mostly the upper and posterior.

Büdinger, by abducting the arm to a right angle with the body, could cause a considerable degree of compression in thin persons, in whom the cords are not protected by the usual deposit of fat.

He also noted that in certain cases a peculiar formation of the thorax and clavicle would permit of a greater degree of compression than ordinarily occurs. The position of the head was also found to change the relation of the clavicle to the first rib. When the head was drawn to the opposite side, and the nerve roots stretched, the brachial cords did not escape by sliding from underneath the clavicle. On the other hand, when the head was drawn toward the side upon which the arm was abducted, the nerves were seen to slip easily outwards, and escape compression.

Braun,[1] one of the earlier writers upon this subject, considers that anæsthesia paralysis of the upper extremity may be due to compression of the nerves at a number of different places in their course. He agrees with Noone, who believes that the commonest cause of the paralysis is an injury to the fifth and sixth cervical nerves, as they leave the spinal column. This is brought about by compression of the nerves between the clavicle and the transverse processes of the vertebræ, as a result of displacing the arms over the head during the administration of an anæsthetic.

Similar paralyses have been noted in the newborn, in breech presentations, when the arms become displaced upwards.

[1] Deutche Med. Woch., 1894.

Direct pressure of the head of the humerus upon the nerve trunks in the axilla, may be the cause of an anæsthesia paralysis. By drawing the arm upwards over the head, the radial pulse may be completely suppressed; the median nerve is at the same time submitted to supreme tension as it passes over the head of the humerus. By bending the elbow and rotating the forearm outwards, the ulnar nerve is similarly affected.

Pressure upon the individual nerve trunk, by the extremity coming in contact with the sharp edge of the operating table, or by compression of the nerve by permitting the patient to rest upon the arm during a prolonged operation, may be the cause for peripheral paralysis. These are identical with the so-called "sleeping palsies" of the upper extremity, and the obstetrical paralysis from pressure upon the lumbo-sacral cord by the descending head.

In operations in which the patient must rest upon the side, or those in which a latero-prone position is to be maintained, particularly when the duration of the operation is longer than usual, compression of the nerve trunks of the upper extremity is most likely to occur. Of the individual nerves compressed in this manner, the circumflex and the radial are subject to the greatest risk. When the Trendelenburg position is employed, the risk of a narcosis paralysis is greatly enhanced. In this position, with the patient's weight hanging from the flexed knees, which are brought in contact with the sharp edge of the operating table, and there fastened, injury to the external popliteal nerves, as they pass forward from behind the condyles of the femur, may cause paralysis of the muscles supplied by these nerves. In one of the author's cases, a bilateral paronial paralysis, followed a double salpingectomy, in which the Trendelenburg position was employed. This completely disabled the patient for six months. Restoration

of function of the paralyzed muscles was not complete until the end of a year.

Another danger of the Trendelenburg position is the tendency of the arms to be displaced over the head and hang downwards over the end of the table, thus favoring compression of the trunks of the brachial plexus or of the cervical nerves, after the manner described by Büdinger, Noone, and Bruns.

As a result of direct pressure upon the nerve trunk by the hands of the anæsthetist, we may also have paralysis or paresis of the facial nerve.

Flateau [1] mentions a case of this kind. In the author's practice, a bilateral facial paralysis that lasted six weeks followed pressure upon the facial made by the anæsthetist during ether narcosis, in an operation for recurrent appendicitis.

Another factor in the causation of peripheral narcosis paralysis, considered by some to be of importance, is the toxic action of the anæsthetic upon the peripheral nerve trunks. Casse [2] holds that while local injury to the nerves probably plays the most important role in the causation of these paralyses, yet the lowered resistance of the nerves to trauma, which predisposes to paralysis, is occasioned by the toxic influence of the anæsthetic. This follows chloroform narcosis more often than ether. In those cases in which the pressure has been insignificant, and the duration of the operation extremely short, the chief etiologic factor is to be found in the local neuritis resulting from the toxic effect of the anæsthetic.

The pathological basis of these narcosis paralyses varies greatly in degree of severity. In mild cases, in which a mere circulatory change in the nerve trunk results from compression, the disability soon passes away. In others, in which destruction of nerve tissue results from trauma, or where marked degeneration, resulting from the toxic action of the drug, seriously impairs the vitality of the nerve fibers, a considerable time may be required to effect a repair. On the whole, the prognosis is favorable, recovery being the rule. In these cases in which the lower nerves of the plexus are involved, giving the Klumpke type of paralysis, the prognosis is more favorable than when the upper nerves, with the associated Erb-Duchenne type, results. This is due to the more severe lesion that generally exists from compression of the upper nerves. With the latter, we may have an associated lesion of the cervical sympathetic, evidenced by myosis, retraction of the bulb, and flattening of the cheek, as has been observed by Krumm.[1]

Central narcosis paralysis is so rare as to be of slight importance. As to the cause, we have little direct evidence that is of value. Two hypotheses are to be considered. First, that the lesion is due to ischemic softening, following a hæmorrhage; second, that there is a primary degeneration, the result of the toxic action of the anæsthetic upon the cerebral cortex. When hemorrhage is the cause of the paralysis, we must assume an existing sclerosis of the vessels, which give way usually during the stage of excitation of an ether narcosis. Büdinger reports a case of paralysis of the left arm that followed an exploratory operation for gastric carcinoma. The patient died seven weeks after the operation. The autopsy revealed a clot upon the center, corresponding to the paralyzed extremity. Where softening of the cortex is found, without the presence of a clot, the paralysis may be considered as the result of a degeneration of the cortical cells, identical to that which occurs in other organs, as the liver and kidney, from the administration of an anæsthetic, particularly chloroform. Büdinger believes this to be a true coagulation neurosis. ALBERT E. HALSTEAD, M. D.

[1] Centralbl. f. d. Greuzgeb. d. Med. Chir., Bd. 40.
[2] Bull de l'Acad. Royal de Belgique, 1898

[1] Abst., Annals of Surg., Vol. 25

TRANSACTIONS OF SOCIETIES

MEETING OF THE CHICAGO GYNECOLOGICAL SOCIETY
NOVEMBER 15, 1907

DR. J. B. DE LEE, PRESIDENT
DR. FRANK W. LYNCH, EDITOR

EXHIBITION OF SPECIMENS

DR. DE LEE: There will be shown a specimen of *Fibroma Molluscum Gravidarum* by Dr. W. H. Buhlig, which comes from a case of my own. Fibroma molluscum gravidarum is a new clinical entity. The term was introduced by Samuel Brickner of New York City, and the case was published in the *American Journal of Obstetrics* in February, 1906.

Fibroma molluscum is a rather common affection in pregnancy, which, now that attention has been called to it, will be described oftener than in the past. Its appearance is the same as that which attacks both men and women, with the difference that the warty excrescences are not so numerous as in that outside of pregnancy; they are more pedunculated and less like warts. The seat of the disease is around the neck and chest and under the breasts. Brickner describes these as characteristic, but in my case they were found on the forehead and the upper surface of the right hand.

This woman noticed in the seventh month of pregnancy little warty excrescences attached to the neck and shoulders, and this large one on the right hand. There were no symptoms other than their presence. This particular case was atypical, according to Brickner, who says they disappear within four or five months fter delivery. In my case the warts fell off before labor, except the one on the hand, which grew larger and larger and finally became infected and had to be removed.

In another case of mine a large wart appeared over the forehead and dropped off two or three weeks after labor without treatment.

Brickner explains the appearance of the warts as due to some abnormal metabolic action. That is as indefinite as a great many of the other manifestations of pregnancy.

DR. W. H. BUHLIG (exhibits specimen): This kind of tumor is described by Brickner as follows: They are small and usually pedunculated, two or three mm. in length and well pigmented. Microscopically, they present a covering of epithelium which does not dip down into the connective tissue as does the normal epithelium, an abundance of soft fibrous tissue with numerous connective tissue-cells and an extreme richness of vessels. Dr. Mandelbaum, who made the specimens for Brickner, found only remnants of elastic fibers and no mast-cells, plasma-cells, nor nerve tissue. The tumor we have here was larger than the ones Brickner reports. It was a centimeter or more in its greatest diameter and about half that in thickness. It was different also, because it was infected, and I have had a good deal of trouble in getting a section that shows an intact epithelium. Most of the specimens I have prepared show infiltration, due to the infection. I have been unable, in the center of the section, to demonstrate elastic tissue, mast-cells, or plasma-cells. The richness of the vessels is the striking point. I had an idea that something was wrong with the diagnosis after I had studied it for some time. There are too many vessels for a fibroma; even a soft one. I have been impressed with the lack of blood in so many of the vessels and with the uniformity of size and structure of these vessels. I recall that Brickner's article contains the statement that many of the vessels were surrounded by small accumulations of cells. I have been struck with the clinical history, the coming and going with pregnancy, and my opinion is that we are dealing, not so much with a fibroma, as with an angioma, or a telangiectasis. This is a mere suspicion as yet and I have no more reason than the facts mentioned, but it acts different from a fibroma and looks different. I have a section under the high power showing a large capillary, spreading right out into the tissue.

DISCUSSION

DR. SCHMAUCH: The specimen under the microscope does not look to me like a fibroma molluscum gravidarum. These growths are made up of fibrous tissue that contains many small bodies which are generally taken for some kind of infectious material. Now here we do not see much

fibrous tissue, but many blood vessels, and that is about all. I would like to justify the diagnosis of fibroma molluscum gravidarum. There is no doubt that many different excrescences might grow during pregnancy, and it is queer that these things fall off after the child is born, but I do not see anything in the specimen shown to justify the diagnosis given.

DR. DE LEE: The appearance of the disease, as seen in the clinical case, corresponds in general to that described by Brickner, who gave it the name. The disappearance of the warts at labor may or may not indicate that they have anything to do with pregnancy. I have not studied the specimen, but the clinical picture corresponds with that given by Brickner. The pathologists in New York who saw the specimens came to the conclusion that would be the best name for the disease.

I wish to report a case of *Torsion of the right ovary and tube, complicated with tumor of the left ovary, in a girl of thirteen*, the specimens of which, unfortunately, have been destroyed, but the clinical conditions are such as to warrant me in bringing it before you.

A girl of 13, who claims that three months previous to admission to the hospital she was raped, entered Provident Hospital with a diagnosis of appendicitis and pregnancy. The history is in brief: She entered the hospital on Sunday. On Friday she had been taken with a severe pain in the right inguinal region, rise of temperature to 101°, with nausea and vomiting, for which she went to bed. Her physician discovered an abdominal tumor. He disregarded the statement of the girl that this had been present eight or nine months, and diagnosed pregnancy of four and a half months, with appendicitis. The next morning the temperature and pains subsided, but the girl began to flow, so he diagnosed threatened abortion, and sent her to the hospital. She was prepared for curettage, but under anesthesia the os was so small that the dilator could not be introduced, and the operation was suspended.

EXAMINATION

A young girl with the signs of puberty pretty well advanced; there was a good deal of hair on the pubes, the breasts well developed, fat on the abdomen well marked. The right rectus was rigid and on palpation very tender, making the tissues underneath impalpable. On the left side a tumor which seemed to extend to the right side, but could not be outlined. This tumor extended to the neighborhood of the spleen, in the kidney region, and at first I thought it a tumor of the kidney. On vaginal examination this was the finding (illustrating with drawings on board). A small, infantile cervix projected sharply into the vagina; in the cul-de-sac of Douglas was a small mass exceedingly tender, and not outlined above. I could not feel the fundus of the uterus very plainly, but from the consistency of the mass I concluded this was not the retroverted uterus. On the left was found what was suspected to be a pedunculated tumor of the left ovary. The attacks of pain after each examination were marked, and the girl grew weaker day by day. These pains came every three minutes, simulating labor pains. The necessity for operation was clear. The diagnosis was made of left ovarian tumor with twisted pedicle, and pelvic peritonitis. At operation the left ovary was found distended into an immense single cavity cyst which reached up to the neighborhood of the spleen, and was removed. The right tube had been twisted one and a half full turns and had fallen back into the pouch of Douglas, making the mass which we had mistaken for an exudate. The twist was clearly defined and the tube was much swollen and congested and dark blue in color; the ovary was the size of a hen's egg and infiltrated with blood and serum. We left a small portion of the left ovary and the whole of the left tube, in the hope of not completely sterilizing the young person.

The after-history of the case was uneventful. The reason for bringing it before the society is the rarity of torsion of the tube and ovary, and the interest in the diagnosis, in that the torsion was on the other side than the one we suspected.

DISCUSSION

DR. CARL WAGNER: Referring to Dr. De Lee's case, regarding the differential diagnosis between pregnancy and tumor. In a case of the kind that I recently saw in consultation, a young woman had had for a month a tumor felt above the symphysis, which suddenly grew so rapidly that in three days its top reached to the costal margin on both sides. There was great resistance on the right side. Pregnancy seemed to be excluded on account of the moral standing of the girl; still, its possibility had to be taken into consideration. The sudden and rapid enlargement was the most interesting feature of the case. Diagnosis of hemorrhage into a cystic tumor had been made.

On careful examination we were unable to find the cervix. The rectal examination gave a bulging mass low down, mostly on the right side. Not to go to too great length, it seemed plausible to me, which afterwards proved to be the case, that we were dealing with a cystic tumor. The girl was 13 or 14 years of age. In the recumbent position

while the patient was being examined by three different men, the tumor suddenly was moved out of its place in the pelvis. It proved that the tumor left the pelvis and found more room during the recumbent posture above the ribs. The cyst was removed and found to bear the character of a dermoid ovarian cyst, and a hard, fibrous-like mass on the right side.

CARCINOMA OF THE CLITORIS

I take much pleasure in presenting to-night a very rare specimen. During the last two years there has appeared the report of only one case of carcinoma of the clitoris in the literature, according to the *Index Medicus*, one described by Dr. R. R. Smith. In the text-books of gynecology by Webster, Skeene, Findley, Pozzi, Schroeder, and Döderlein, there is not even mention made of this affliction. Only in Charles Reed's book I find reference made to this disease in a quotation of his with reference to Gaffe's case which constituted a primary epithelioma of the clitoris followed by very speedy lymphatic involvement. He also reports a case observed by Witacre with microscopic illustration. Kelly, in all his wide experience, has reported but two cases of this kind. In dealing with diseases of the clitoris, he says: "With a single exception diseases affecting the clitoris alone are exceedingly rare, while in elephantiasis of the external genital organs the clitoris is prone to be the organ most extensively involved. Carcinoma is rare." The most extensive reference to cancer of the clitoris is made in Veit's Handbook of Gynecology. This volume in a very brief résumé has collected 18 cases from the literature, and not 16, as Smith states in his article. Sixteen authors observed individually one case, and one of them reports two. The cases of Eisenhart and Torglers showed transgression of the carcinoma into the labia.

In my case the carcinoma of the clitoris invaded the region above into the mons veneris, causing a large defect in size corresponding to a crab apple. The growth started four months before operation as a small pimple which soon manifested a destructive character, and was treated during the time by the family physician for an ordinary ulcer. Salves of different descriptions were applied without any success. The patient, 70 years of age, never suffered much pain. She was of German parentage and has never been seriously ill. Neither were there any other pathological conditions present at the time of the operation. The operation consisted in the following steps:

First, dissecting away from the carcinomatous mass the urethra, which was intact. For safety's sake a soft rubber catheter was placed in the urethra previously and acted as a guide.

Second, from the former seat of the urethra two oblique lateral incisions (sidewards and downwards) at an angle of about 150 degrees were carried through the upper part of the labia majora. From the outer ends of these two incisions vertical incisions in an upward direction of about 2 inches in length clear down to the periosteum followed, and these latter were united on their upper terminals with a transverse incision. The defect caused by the removal of the malignant growth necessitated a plastic operation, the successful result of which, especially cosmetically, was made possible by the following steps:

The upper transverse incision was continued into the healthy tissue bilaterally about one inch and a half beyond. Second, the lateral border tissues of the defect were undermined on the level of the periosteum until they could be made freely movable and brought in exact apposition. Lateral pressure exerted by means of wire suture passed through leaden plates, an inch in diameter, and fastened at both ends after tightening them with lead bullets, held the raw surfaces in correct apposition without any inflammatory reaction until the union had perfectly resulted.

What was left of the labia majora was sutured with fine silk in interrupted stitches, beginning at the lowest part. It is important to start way down at this end, as after bringing the correctly corresponding wound edges in apposition at that point, they turn under to some extent so that they are very hard to see and poorly accessible if one would come from above downwards.

The microscopical examination of the specimen was made by Dr. Maximilian Herzog: "Microscopic examination of the tissue removed shows that it is mostly composed of proliferated epithelial cells. The latter are of a large squamous type and they are arranged in alveolar nests, surrounded by fibrous connective tissue. The structure of the neoplasm is that of a typical alveolar squamous cell-carcinoma."

Dr. T. J. DOEDERLEIN then reported a case of *Pubiotomy*, and showed a number of deformed bony pelves. (Ses paper, page 176.)

DISCUSSION

DR. CHARLES E. PADDOCK, speaking on the relation of pubiotomy and symphyseotomy, said: Is pubiotomy a better operation than symphyseotomy? Will it take the place of the Cæsarian operation, high forceps, or version in contracted pelves? A few years ago symphyseotomy was placed before us by leading obstetricians as one

void of the usual mortality, morbidity, etc., of the other operations, and it looked for a while from reports that we might have at last found an operation such as we had been seeking. Soon, however, came reports of both maternal and fetal deaths from this operation, and it did not prove what we had hoped for. We now have under consideration pubiotomy. We find it praised and condemned by equally good men, and the question arises, Is it to revolutionize our operative obstetrics?

In the proper discussion of this subject we must take into consideration two or three factors: first, do we obtain the same enlargement of the pelvis and the same separation of the bones in pubiotomy as in symphyseotomy? Second, what structures are involved, and what is the effect upon these during or subsequent to the operation? That we might properly understand this, it seems necessary that we should know something of the anatomy of the parts involved. There are certain tissues which are injured in the pubiotomy, which are not injured in symphyseotomy. Do we do more damage in the one than in the other? We will concede that there is no difference in the degree of separation in the two operations; that the enlargement is comparatively the same. On the other hand, there is an irregular enlargement following the operation of pubiotomy which somewhat alters the shape of the inlet. The increase seems to be in that oblique corresponding to the same side as the incision. If the incision be on the left side, the left oblique will be the longer. The sacro-iliac joint will be thrown somewhat open, and the anterior ligament will be stretched and torn. Just what effect this irregular enlargement might have upon a case if left to nature to terminate, I am unable to say. As a rule, these cases are terminated artificially.

As to the anatomy of the parts, the abductor foramen is in close proximity and must be avoided. It never extends internal to the tuberculum pubicum. So if the incision be made just internal to the tubercle, it will escape the foramen. Inside of this is the pubovesical ligament, and any injury to this might mean the loss of support to the bladder. The crus of the corpus cavernosum clitoris runs along the lower border and ramus of the pubis, and is certain to be injured in its other two thirds, as it is in the line of the incision. The speaker before me referred to the possibility of escaping the cavernosum, which could only be possible by dissecting the periosteum from the bone, then passing the carrier between the periosteum and the bone. But even should this be done, it would be difficult to escape the hemorrhage. However, the hemorrhage is easily controlled and should be relalively a very small matter. Then the plexus of veins close to the uterus, vagina, and bladder are not so liable to be injured in pubiotomy as symphyseotomy. The other source of hemorrhage is in the vulvo-vestibularis, which extends down from the clitoris; this, however, is rarely injured unless the needle is passed too far forward, and the hemorrhage from this artery amounts to little. The periosteum also contains blood vessels which are injured, and this may cause a certain amount of oozing.

The muscles involved in the operation are many, and some have such an important function that upon their integrity depends the future welfare of the patient. First, and very important, is the pubovesical ligament, which I have mentioned before; next, the rectus abdominalis and pyramidalis. The rectus abdominalis remains attached to the bone, hence the integrity of the abdominal wall is preserved, whereas in symphyseotomy the fibres would be so torn that the support of the abdomen might be injured to a large extent. Upon the internal surface of the bone we find the abductor longus and, running obliquely, the abductor brevis. These are more or less injured. The levator ani extends from the inner surface of the body and ramus of the os pubis and reaches almost to the symphysis. Next in importance is the transversus perinei profundus, which surrounds the urethro-vagina and is attached to the bone as far as its junction with the ischium. These two muscles are important in the support of the uterus, and I think are not permanently injured in pubiotomy, as demonstrated by the absence of reports of prolapsus following the operation. Many more tissues are involved, but these are the principal ones. Now, the stretching of the symphysis pubis in symphyseotomy causes a stretching and tearing of the pubovesical ligament, a condition which is escaped in pubiotomy. Somewhat to be feared is the transverse stretching and possible rupture of the bladder, and the consequent injury to that organ. The transverse perinei profundus and other muscles in this region must deliberately be torn, in order that the bone can be separated. Following this we have report after report of cases that have been permanently injured with nonunion at the symphysis, ruptured urethras, vesicovaginal fistulas, etc. That pubiotomy has a distinct advantage over symphyseotomy there can be no doubt. The structures injured are not as important as in symphyseotomy. The object sought is to obtain the separation of the bones and enlargement of the pelvis with the least traumatism to the mother. While there must of neces-

sity be more or less injury, the recent reports of cases of this operation are more favorable than those reported of symphyseotomy after the same duration of time.

DR. DE LEE: In 1895, Queirel, a Frenchman, read a paper entitled, "Eleven Symphyseotomies which I did not do." Upon reading the article with this bizarre heading, I discovered he had determined eleven women for symphyseotomy, each of whom had been delivered spontaneously or with forceps. Some were delivered at home before they could get to the hospital, others after normal labor, or with low forceps operation, delivered of living children without serious interference. He evidently desired to show the fallacy of obstetrical judgment in regard to labors in contracted pelves.

I wish to report two cases of hebosteotomy — a term decided on at the last German Congress held in Dresden — which I did not do, not for the reasons given in the cases of Queirel, but because of contraindications.

The first was a primipara, 25 years of age, who had a flat, rachitic, generally contracted pelvis with a conjugata vera of 9 to 9½ cm. She had, in childhood, sustained a serious fall and had fractured her sacrum, so it had a shape as illustrated here (draws on board); there was callus still present on the back of the sacrum, and the cavity of the pelvis was encroached upon by the lower end of the sacrum and coccyx, so that I thought the child could not be delivered without the proposed hebosteotomy. The woman had been in labor twenty-six hours, the head was well moulded, the child in excellent condition, dilatation complete, and I intended to perform hebosteotomy. When I arrived at the patient's side I found the temperature 103°, pulse possibly 120 to 130, not very full, a foul discharge from the vagina; therefore I did not perform the operation, fearing general sepsis. I delivered the patient by high axis traction forceps with difficulty, but without perforation. The infant survived an hour or so, and died from the effects of the delivery. I confess, it would have been easier to have performed craniotomy, but those of you who have performed that operation on a living child will sympathize with any reasonable attempt to deliver a viable child. I was astounded that there was not the slightest amount of visible laceration after this serious operation; but the patient returned to the clinic in three months with almost a complete prolapsus of the uterus, showing that while visible lacerations had not been made, deeper ones must have been.

The second case occurred on my return from abroad. A Russian Jewess, aged 19 or 20, had been in labor for forty-four hours, had almost complete dilatation, and a child of normal size making a good attempt to enter the inlet, which was estimated 10½ to 11 C. D., C.V. 8½ to 9; transverse, 11 cm. This woman's pelvis had the sacrum projecting rather sharply into it. By means of the little outlet pelvimeter which I demonstrated several years ago, it was possible to measure the distance between the lateral walls of the pelvis, which was 11 cm., measured as accurately as any measurement could be taken. The distance between the spines was 10½, and between the tuberosities between 8½ and 9. We had to deal with a generally contracted, flat, rachitic pelvis, with the head well moulded, and it was reasonable to suppose that with a slight enlargement the head would enter.

The woman refused to allow any cutting operation. Cæsarean section was entirely out of the question. However, I was so enthusiastic about the operation from what I had seen abroad, and from the reports of the cases in the Congress at Dresden, that I determined to take the risk on my own responsibility without the patient's consent. I prepared for hebosteotomy and passed the needle, following the Doederlein method, i. e., passed the needle under the guidance of the finger on the posterior surface of the pubis. The finger half-way down the pubis pushed the head away, and protected the bladder. After passing the needle I did something not done before, as far as I have seen in the literature,— I catheterized the patient again to make sure there was no injury to the bladder, because I feel most injuries to the bladder are done by the needle and saw, and not by the separated bones of the joint tearing the bladder. On catheterization blood-tinged urine came away, and so I came to the conclusion I had punctured the bladder. No one has mentioned the puncture of the ureter. We know in cases of pregnancy the bladder is drawn up and squeezed against the brim of the pelvis, because fistulæ occur in this region, and in certain locations, as shown by fistulæ, the ureter is brought into danger. It was, therefore, possible that it was the ureter that was injured. Under the circumstances I withdrew from the operation. Had I had the patient's permission to perform pubiotomy, I would probably have withdrawn the needle and put it in again under more perfect guidance and taken the chance, but I felt the puncture of the bladder had changed it from a favorable to an unfavorable case, and therefore proceeded with the application of axis traction forceps and the demonstration that the head would not go through the

pelvis; in the meantime the child had suffered from the prolonged anesthesia, etc., the meconium was showing, the heart rate had fallen, and the unwilling perforation of the living — or rather the dying child was made. The patient made an absolutely perfect recovery. I put a catheter into the bladder, and a tiny clot came away. The catheter remained in place three days, changed thrice every day, and the woman has promised to come back next time for Cæsarean section.

A few points in regard to the operation of pubiotomy:

First, the dangers to the patient; lacerations of the bladder, and I must add of the ureter, and urinary infiltration, such as have been reported in literature. I believe a simple puncture of the bladder is harmless, especially with a round instrument, because I know it has often occurred unwittingly and unknown to the operator; you make these punctures for retained urine, and the patients do well even when the urine is decomposed and infected. But the saw wound is dangerous, and if this happens it is suggested that an incision be made and the bladder sewed up.

Hemorrhage from the incision also is to be feared. Von Rosthorn referred to a case where the woman died on the table in spite of efforts to save her. Experience has shown that after pubiotomy, when hemorrhage sets in, the quickest way to control it is to deliver the child, and then check the hemorrhage. In this case an attempt was made to check the hemorrhage without delivery.

The question of sepsis in cases of pubiotomy is not so simple. It is not simply a question of carrying infection in by the insufficiency of our technique, or simply the danger of infection that exists in the vulva and vagina, but another element, infected urine, and in case of bladder puncture the danger is greater. I believe in the case reported of urinary infiltration where the catheter became stopped up the patient would not have died had the urine been aseptic primarily. I have had cases of infected urine where it showed colonies of streptococcus. To this woman I gave urotropin, as in all cases where the bladder has been seriously bruised.

Lack of union; there were shown at this Congress at Dresden 26 X-ray photographs in some of which the union was undoubtedly bony, so the lack of union is not so much to be feared. When symphyseotomy was at the height of popularity I performed two operations, both successful for mother and child. One operation was performed for flat, rachitic pelvis in a woman with immense varicosities. She developed a small hematoma, but recovered without trouble. The other case was a contracted pelvis of the infantile type, the head visible, but it could not be extracted with forceps. The symphyseotomy wound communicated with an immense vaginal tear, the perineum being rigid, episiotomy was performed, requiring an extensive perineorrhaphy. The bladder prolapsed between the end of the bones, and the whole genitalia had to be adjusted by means of tampons, but she also made a recovery, and both these women have been delivered of living children since, weighing more than those I delivered, one spontaneously and the other by version extraction. I gave up symphyseotomy because of its brutality. It was an unlovely operation and I disliked to perform it, and that seemed to be the general reason why it was given up. Hebosteotomy, on the other hand, has not that repulsiveness; the frequency of lacerations of the vagina is not so great, and I predict for the hebosteotomy a longer existence and perhaps a little larger place than symphyseotomy ever will possess. At this Dresden Congress pubiotomy took up three fourths of the time, and we heard four or five hundred cases reported. They are doing hebosteotomy more in some clinics than they do episiotomy. In Bumm's clinic the month I was there they did 14. They let the woman go into labor and continue a reasonable length of time. If the head does not enter the pelvis they do a pubiotomy and let her continue in labor. Bumm teaches that the safety in pubiotomy lies not in immediate delivery, but in letting the woman deliver herself after the section of the bone. That is very simple. Of course, in an absolutely contracted pelvis Cæsarean section is done. But in those cases where formerly craniotomy was done on living children, they now let the woman labor, and when the head will not come down after a reasonable time, cut the bone. In Schauta's clinic Berger reported 26 cases without maternal death. While I was there, six weeks, I think they performed 6 or 7 more cases. In Chrobak's clinic they perform no pubiotomy. In Olshausen's they do not believe in pubiotomy. He prefers the Cæsarean section, or prolonged labor. In Paris the only operation I had a chance to see was symphyseotomy, and Pinard gave a number of reasons to prove it was easier and to be preferred to pubiotomy.

In Italy they perform pubiotomy, and Bossi told me they had great hopes for the operation.

When talking of the various methods of performing hebosteotomy, one must not forget to mention Ayers of New York. The subcutaneous method of performing the operation is to be preferred to the open. I mean the Doederlein method of half and half, the finger being used behind the

joint. Ayers of New York invented the subcutaneous symphyseotomy, and performed it in 11 cases successfully for the mothers, and I think, also, for the children; perhaps he lost one baby.

I wish to emphasize the point of spontaneous delivery versus immediate operative delivery. After the joint or the bone is cut, the patient is allowed to wake up from the anesthetic, a tight bandage is put around her to support the pelvis, and she is put back to bed being allowed to deliver herself, and experience shows lacerations of the perineum and vagina are less common.

Regarding the mortality, I think the reports published at this congress were very favorable, 3½ to 4 per cent for hebosteotomy, and that is favorable, when you consider the mortality of 3 per cent in Cæsarean section in the most favorable cases. In contracted pelvis you can perform hebosteotomy when the woman has been in labor for hours and attempts at delivery have been made, where Cæsarean section is contraindicated. The physician can with reasonable fairness recommend a hebosteotomy as an alternative to craniotomy on the living child, and any one who has performed the latter operation will be glad that there is something that can be fairly presented as an alternative. Of course, I believe that when you see a contracted pelvis during pregnancy, in which the chance of delivering a full term child at term is remote, these two alternatives should be given to the patient, the induction of premature labor or the performance of Cæsarean section under ideal conditions at term. The induction of premature labor at 7½ or 8 months will still have a place in practice.

Dr. Wagner: I think we should congratulate Dr. Doederlein for his case and thank him for bringing this subject before the society, as so much has been written abroad on this question.

While many cases turn out very favorably, it seems to me that the operation, after all, is not a proper surgical or anatomical one, and especially the operation of Crede. When I read the description of this operation a year and a half ago, it struck me as being most unsurgical. It provides a great danger in case of suppuration, because we have separated bone. But even without suppuration the operation is so complicated, going into the foramen with the possibility of rupturing and dislocating the bladder and even greater complications. The operation is not proper surgically and anatomically, for there is no fair possibility of controlling accidents such as tearing the bladder and blood vessels, as everything is done in the dark.

Another point, the possibility of embolism, which with the abnormal circulation at this time of a woman's life is not altogether improbable. In general surgery we have, since asepsis has been perfected, given up subcutaneous operations, which were done formerly on account of bad technique. Since we have reached our present state of technique, in the Achilles tendon operation, etc., we do the open operation, on account of possible abnormalities. I do not see why we should take this great risk in subcutaneous operations in the pelvis, when the tissue is so prone to infection, and in the presence of an infectious canal like the vagina.

Another point is that the needle goes through and the knife enters the labia minora, a tissue very poorly nourished and consequently easily infected.

Dr. Gaul: Last year on the 16th of September I was called in consultation in a case of labor. The woman had been in labor for two days; a midwife had been attending her for 36 hours, when a physician was called in to help out. He applied forceps repeatedly, but could not deliver. I found the head wedged in the pelvis and tried to apply the forceps, without result, and finally concluded something else had to be done. I found the fetal heart tone very good and did not feel justified in making a craniotomy. I took the woman to the hospital, and since the midwife had made repeated attempts at delivery, and since myself and colleague had also done the same, I concluded to perform a pubiotomy in preference to Cæsarean section, and I was glad I did, for there was a violent infection. I inquired for a hebosteotomy saw and found there was none in the hospital, and in my desperation I resorted to an open operation, cutting through the bone with a scalpel. The child was extracted with forceps, and was found to be asphyxiated. I wired the pubis and brought the parts together. There was a violent infection, but after five weeks this subsided, and the woman finally left the hospital with the parts healed up and in good shape. I saw her in April, and she had a perfect gait. It was a better result than I ever dared to hope for.

I think Doederlein's prophylactic placing of the saw is good in maternity hospitals, but would not do in general practice, as a man would not have much practice if he tried it.

Duehrssen advocates a single incision in the angle of the pubis and passed the saw around the pubic bone and back and around to the original incision. This I would not try.

Dr. Doederlein (closing discussion): I have seen twice in literature reports that the saw broke. This is explained by the fact that the saw is handled with the hands too close together.

I heartily coincide with Dr. De Lee's views as to the practicability of pubiotomy. I hardly think it will take the place of Cæsarean section.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF SURGERY

UNDER THE CHARGE OF

JOHN B. MURPHY, M. D. — E. WYLLYS ANDREWS, M. D.
FREDERIC A. BESLEY, M. D. — WM. R. CUBBINS, M. D.

AN ABSTRACT OF THE REPORT UPON THE FRENCH CONGRESS OF SURGERY PARIS, 1907

PREPARED FROM THE REVUE DE CHIRURGIE, 1907

BY AIMÉ PAUL HEINECK

I. THE INFLUENCE OF THE RŒNTGEN RAY ON MALIGNANT GROWTHS

Béclère of Paris said that neoplastic cells with few exceptions are more sensitive to the action of the Rœntgen rays than the neighboring healthy cells. The lethal dose for neoplastic cells is far inferior to that which can be tolerated by normal cells. He discussed successively the influence of the Rœntgen rays upon malignant tumors of the skin, of the mucous membranes, of those mucous membranes that are continuous with the skin, upon malignant disease of the mammary gland, of the subcutaneous tissues, and of the viscera.

1. *Malignant Tumors of the Skin.* In some of these tumors, the productive process exceeds the destructive. In such cases, there will be a palpable tumor of varying shape and volume. Some cutaneous epitheliomata have been cured by the use of the X-rays. It will be found, however, that it is most often of great advantage to combine surgical intervention to the X-rays. Other cases show a predominance of the destructive process and are characterized by a loss of substance of varying depth and surface area, by an ulcus rodens; other cases show an association of tumor and loss of substance. Under influence of the Rœntgen rays, malignant ulcers often take the aspect of a healthy wound; tissue-losses are repaired either partially or completely; cicatrisation follows. All cutaneous epitheliomata that have not extended beyond the derma can with few exceptions be cured by X-ray therapy. They can be cured definitely, that is without recurrence, if the dose of the Rœntgen rays absorbed notably exceeds the dose strictly necessary to secure an apparent cure. For these tumors, especially if they be located upon the face, Rœntgen-ray therapy is the method of choice. It cures them with an esthetic perfection which is attained by no other form of treatment. When the epitheliomatous tumors have progressed beyond the deeper layers of the skin, Rœntgen-ray therapy may be successful; more frequently, in the presence of these conditions, its use is attended with failure. Rodent ulcer is favorably influenced by the Rœntgen rays. The X-rays destroy the morbid tissue, arrest the ulcerative process, and often secure complete cicatrisation. In severe forms of cutaneous epithelioma X-ray therapy is a useful complement of surgical intervention. In the ulcerating forms, considered inoperable, though not curative, it is to say the least the best of palliatives. Its use against epitheliomata that have not extended beyond the derma is attended with satisfactory results.

2. *Malignant Tumors of the Mucous Membrane.* Those mucous membranes that are directly accessible to the Rœntgen rays are those which are continuous with the skin, are those present in the neighborhood of the natural orifices: the palpebral, the conjunctival, the nasal (only a portion), the labial, the buccal, the pharyngeal, the anal, the vaginal, the preputial, and other mucous membranes. In epithelioma of the mucous membranes, the opinion prevails that the X-rays are powerless. They are even considered harmful, by some, in neoplastic disease of the mucous membranes. This opinion is erroneous. Concerning epitheliomata of the tongue, some undoubted successful cures are reported. It must be acknowledged that these cures are not very numerous. Béclère himself

has seen the disappearance, under the influence of the Rœntgen rays, of an epitheliomatous tumor of the tonsil. These observations show that the neoplastic cells originating from the mucosal epithelium are no less sensitive to the action of the Rœntgen rays than those that originate from cutaneous epithelium. The infrequency of success attending the use of the X-rays in mucosal cancers is due to the rapid evolution of these tumors, to their rapid invasion of the lymphatic system.

3. *Malignant Tumors of the Breast.* Malignant tumors of the breast at all stages of their evolution can be benefited to a certain extent and for a period more or less long by Rœntgen-ray therapy. When the neoplasm is limited to the breast it may disappear under certain conditions, slow growth, etc., when subjected to the influence of the Rœntgen rays. After surgical intervention, X-ray therapy is very efficacious in the treatment of cutaneous recurrences. It causes a disappearance of the nodosities in the derma and heals, most always, the cancerous ulcerations whatever be their extent or their aspect. In inoperable and in recurring cancer of the breast, Rœntgen-ray therapy may obtain a local cure, may improve the patient's general condition, prolonging life, alleviating suffering, and offering the patient some illusions.

4. In malignant tumors of the connective-tissue type, sarcomatous cells seem to be more sensitive to the action of the Rœntgen rays than the epitheliomatous cells. In lymphoma, the use of the Rœntgen rays has given some happy results. In leukæmia and spleno-megaly, Rœntgen-ray treatment is a specific. However, the cure is only apparent. It retards death. Recurrence occurs and death follows.

5. As far as malignant tumors of the viscera are concerned, no beneficial results have been obtained, or if obtained, have been too slight to be noticed. Some fortunate results are reported in which the X-rays were used in malignant disease of the laryngeal mucosa, in malignant disease of the thyroid gland. The cases are few and their exact nature is not undoubted. Rœntgen-ray therapy as a rule is a two-edged weapon — it may heal, it may wound.

1. The dose may be excessive, and an excessive dose may be due to too frequent séances, to too prolonged exposure, to needless prolongation of the treatment. The excessive dose is more harmful to mucous than to cutaneous surfaces. A cutaneous surface can be dressed aseptically; a septic and infected cavity can not. Pigmentation, erythema, and desguamation may be therapeutic necessities, ulceration and mortification of the tissues must always be avoided. X-ray burns are painful; they take months to heal. They necessitate a discontinuance of the treatment directed against the neoplasm.

2. An excessive dose can contribute directly or indirectly to the progress of the neoplasm. Success in Rœntgen-ray treatment of malignant tumors is dependent upon four factors: first, the seat of the tumor, that is, the more or less superficial or deep situation of the cellular elements of the tumor; second, the sensitiveness of the cellular elements of the tumor to the action of the Rœntgen rays; third, the rapidity of growth, the rapidity of evolution of the tumor; fourth, the integrity of the blood-channels, of the lymphatic vessels and especially of the lymphatic nodes into which the lymphatic vessels of the region empty.

When a malignant tumor is operable it must be operated upon immediately. After the ablation of all malignant tumors, Rœntgen-ray therapy may be employed to prevent recurrence. In these cases the Rœntgen ray must be directed, not only upon the region operated upon, but also upon the lymphatic glands which drain the region of the operative field. In all inoperable malignant tumors, X-ray therapy is indicated. It is the only rational medication and the palliative agent from which we can expect the most.

X-ray therapy is not a rival: it is to be considered only an auxiliary, an aid, to surgery.

M. Maunoury, Chartres, said clinicians have lost confidence in X-ray therapy. This is a mistake, as the X-rays are a valuable weapon; skillfully handled, they give decided results. Outside of cutaneous epitheliomata X-ray therapy can only be considered as an auxiliary to surgical treatment. In inoperable cases, they are a valuable palliative. X-ray treatment is influenced by the method of application, also by the nature of the tumor. Their action is slow; it is local and superficial. It is difficult to determine beforehand what will be the result of their use. Peculiar individual idiosyncrasies exist. Accidents attending their use can occur.

This is the technique which I have adopted: When the operation seems to have been complete, that is, when all the neoplastic tissue appears to have been removed, I subject the operative wound to the action of the X-rays; the margins of the wound are then united, and the subsequent applications will be made through the skin. They are not begun until at least weeks have elapsed. If the operation has not been complete, that is, if all the diseased tissues have not been removed, I do not unite the edges of the wound, but pack the wound with gauze and make a weekly exposure of the X-rays either through the dressings or directly upon the wound. I have with this technique

obtained excellent results. I am thus enabled to diagnose early the first manifestations of a recurrence and to treat them energetically.

Among the accidents that can follow the use of X-ray therapy, X-ray dermititis is one which can usually be avoided. In subcutaneous cancers, true toxæmias, due to absorption of the destroyed cancerous elements, have been observed. These toxæmias manifest themselves by backache, diarrhea, vomiting, dyspnœa, and various eruptions. In some cases, death has followed quite rapidly. It is not proven that the use of the X-rays can aggravate or generalize an existing cancer. We must also state that epithelioma can develop upon the margins of ulcers, due to X-ray burns, and upon lupoid lesions that have been subjected to the X-rays. From the standpoint of technique, there are no absolute rules. To me, massive doses applied at long intervals are preferable. The (globe) is placed at least 15 centimeters from the skin. The surface irradiated must largely exceed the diseased region. You will avoid the formation of X-ray ulcers secondary to excessive irradiation by protecting sufficiently the parts treated. Often, you will be able to activate the cure by curetting the fungating portions of the tumor.

In cancer of the mucous membranes, the prognosis of X-ray therapy is less favorable. It is unusual for the neoplasm to be limited to the mucosa. Some successes have been reported, nevertheless. Use the knife and employ the X-rays as a preventive of recurrence.

In subcutaneous cancers and in cancers of the breast, surgical treatment must precede and then the X-rays may be applied. In cases that are inoperable because of the poor general condition of the patient, or inoperable because of the wide extent of the neoplasm, the X-rays may be applied.

As to visceral cancers, the X-rays are merely palliative. Some sarcomata are especially sensitive to X-ray treatment.

To summarize, Rœntgen-ray therapy is an excellent aid to surgery. All operable tumors must be removed and the X-rays employed subsequently; if feasible, before uniting the edges of the wound. If you fear a recurrence, leave the wound open so as to favor the action of the X-rays. Make no plastic operation until all danger of recurrence has disappeared. The involved lymphatic nodes must be treated the same way.

Pozzi, Paris. The X-rays have indications. High frequency and high tension sparks have an indication. They are both of value in the treatment of malignant tumors. The X-rays give excellent therapeutic and esthetic results in epitheliomata of the skin, especially those of the face. They at times secure complete disappearance of certain osteal sarcomata. In cancer of the breast, be it or be it not ulcerative, the X-rays do not obtain a complete cure. At times they attenuate the pain and retard the progress of the disease. In mucosal cancers, the use of the X-rays is attended by very slight if any therapeutic effects.

Fulguration applied to epitheliomata of the face gives results as brilliant as those obtained by Rœntgen-ray therapy. In the treatment of epitheliomata of the mucous surfaces, it also gives successes, but at times the success is more or less complete, just as the failure may be more or less complete. We do obtain attenuation of the pain and arrest of the hemorrhages. However, X-ray-therapy and fulguration are only auxiliary measures in the treatment of malignant tumors. They should be employed only when the knife is powerless to secure a total eradication of the disease, or in those cases where the patient, either through fear of the knife or for esthetic reasons, fears the operation. Both methods may be combined.

M. Doyen, Paris. I criticise Béclère for not fortifying his conclusions with statistics. He only reports temporary improvements. It is important to know how many of these patients have remained cured and how many have died after having been considered as cured.

As a matter of fact, the X-rays do not cure cancer. Far from that, they cure only small cutaneous epitheliomata, which are not cancers. In an established cancer, they give no lasting results, and their application is almost always followed by a rapid generalization, owing to their destructive action upon the lymphatic nodes and other lymphoid tissue.

M. Reynès, Marseilles. I often have had occasion to judge the results obtained in Marseilles by. M. de Keating-Hart, with fulguration. The electric spark renders the tissue friable and bloodless. For this reason curettage should precede and not follow fulguration. I have always been impressed with the beneficial effects of high tension and high frequency sparks upon the hemorrhages and upon the pain of malignant tumors. I have seen cure following their use in cutaneous epitheliomata. I have never seen a case of visceral cancer which they have cured. The method is still new and the observations reported are too few to justify conclusions.

M. Willems, Gand. Under the name of lymphadenoma, malignant lymphoma, lymphosarcoma, and Hodgkin's disease, different diseases of the lymphoid tissue, characterized by absolutely different anatomico-pathological changes, have been confounded.

We may have:

1. A simple hyperplasia, more or less generalized, of the lymph nodes.

2. Hypertrophic form of lymph-node tuberculosis. The tuberculous nature of the granulation tissue present in these lymph-nodes has been demonstrated by inoculation tests.

3. Neoplastic lymph-node disease. This form has been taken for sarcoma. It should be called lymphoidoma, because it does not originate from the connective-tissue elements of the lymph-nodes. It is due to an atypical proliferation of the lymphoid elements. These lymphoidomata metastasize by way of the lymphatic vessels, and not by means of the veins as do the sarcomata.

Clinically, these three different forms have dissimilar symptoms.

In the hyperplastic form (No. 1) there is a lymphocytosis. In the tuberculous form, there is a leucocystosis. In the neoplastic variety, there are no blood changes. In the tuberculous form, there is usually an evening rise in temperature. The other two varieties are apyretic. Tuberculous lymph-nodes, owing to their early sclerosis, are harder in consistency than the other types. In the tuberculous form, hæmophilia is not uncommon, the fundus oculi shows leukæmic changes. In the simple hyperplastic and in the neoplastic forms, there are no retinal changes, there is no hemorrhagic diathesis.

These three varieties are influenced differently by the X-rays, while in the hyperplastic form the ganglionic masses melt with surprising rapidity under the influence of a few X-ray treatments; the neoplastic form is never influenced and the tuberculous form, if influenced, is only so after many months of treatment. In the simple hyperplastic form, operation is not urgent. It is imperative to intervene early in the tuberculous and in the neoplastic form.

M. TUFFIER, Paris. In 1904, I said that though Rœntgen-ray therapy had given some good results in small cutaneous epitheliomata (have not all forms of medication given good results in these cases?), its action upon carcinomata of the mucosa, of the breast and of the viscera is nil and doubtful. My opinion has not been modified since. If anything, it has been strengthened.

The action of the X-rays must be studied separately in sarcomata and in epitheliomata.

a. The X-rays are "respectful caustics of the skin" — that explains their powerlessness towards subcutaneous tumors. Their inefficacy is not complete, however, and in ulcerating, granulating, bleeding tumors, the X-rays exert an hemostatic, cicatrising, and anodyne action. They can be used only as a palliative measure.

b. Until further notice, we must be very cautious in appreciating the results of X-rays in sarcomata. Under this name are grouped tumors of very different life-history, some of which never recur after removal, whatever be their volume or their seat; others which, though superficial and of very small volume, recur and metastasize with despairing rapidity. Further investigations are necessary. However, even now I consider that X-ray therapy in true sarcomata will only obtain failures. As to the statement expressed by M. Maunoury to apply X-rays upon a wound left open after a cancer operation, I consider that a step backward in surgical technique. That advice should only be followed in cases where after an extensive removal of tissue, approximation of the teguments is not possible.

M. THIÉRY, Paris. I consider X-rays as completely powerless against subcutaneous, muscular, and visceral cancers. The only indication for their use is in some superficial cancers of the face, where for esthetic reasons the use of the knife is refused.

M. GANGOLPHE, Lyon. The X-rays can exert, at times, a beneficial action upon malignant tumors. I operated upon a patient with lymphadenoma. Recurrence yielded to the action of the X-rays. Two subsequent recurrences also yielded to renewed exposures.

I am acquainted with five cases of breast-cancers which, operated upon in 1903, were subsequently subjected to the X-ray therapy. They have not recurred. I am also acquainted with one case of recurrence of cancer of the breast which disappeared under the influence of the X-rays. This last case is as yet too recent to speak of permanent disappearance.

M. MORESTIN, Paris. X-ray exposures, when skillfully applied, should not provoke accidents. Their application is at times faulty. We can say that the X-rays possess no efficacy in the treatment of deep cancers. In the treatment of cancers of the breast, cancers of the mucosa, they possess no virtue, they possess no curative value. In small cutaneous epitheliomata, they do not obtain better results than the knife. Why, in face of the evidence that we possess, should we reserve the apparently mild cases to X-ray therapy and the serious cases to the knife? We think it is a mistake to lose precious time with X-rays. As for those wounds following the removal of malignant tumors, in which the edges cannot be approximated, it is justifiable to subject them to X-ray exposures.

MM. LÉON IMBERT ET G. DUPEYRAC, Marseilles. During the last three years, we have treated with X-rays the following cases. Successes and failures

are included. One hundred and seven patients were treated with the following results:

1. Cutaneous epitheliomata: 23 complete cures, 5 failures; that is, 82 per cent of recoveries.

2. Mucosal epitheliomata: 16 failures, 1 temporary improvement; 100 per cent failures.

3. Breast-tumors: Two small adeno-fibromata, 11 typical cancers; not one cure, some appreciable improvements. In one case, the improvement allowed us to operate a case which previously we considered inoperable.

4. Diverse tumors (prostate, epididimys, larynx, tonsil), failures as a rule.

To summarize, it can be said that the X-rays cure cutaneous epitheliomata, and secure an improvement in breast tumors, especially in recent recurrences. In all other conditions, failure is bound to attend their use.

M. CERNE, Rouen. The Rœntgen rays are not invariably curative in rodent ulcers. I have had failures and recurrences attending their use in this condition. Those cases that are to be benefited by this therapy will show improvement after the first few exposures. In visceral or deep tumors, the X-rays exert no action previous to operation. After operation, they seem to prevent recurrences. Therefore, I believe that they are indicated never before operation, always after. My results have been more satisfactory since I have observed the fore-mentioned rule.

L. MAYER, Bruxelles. In my name and in the name of Dr. Hauchamps, director of the X-ray laboratory of the hospital, I wish to relate several cases which were benefited in various degrees by the X-rays.

1. Several complete successes (lasting over four years) in a few cases of rodent ulcer of the face.

2. Lasting improvement in a case of Paget's disease.

3. Lasting improvement in a case (first treated over three years ago) of cancer of the breast, in which the axillary glands were involved and the patient had refused operation. The diagnosis was confirmed by microscopical examination of a removed axillary lymph node.

4. Use of the X-rays to prevent recurrence after operation in cancer of the breast. I see no necessity of leaving the operative wound open. The skin does not offer sufficient resistance to the passage of the X-rays to warrant this procedure.

5. Two cases of leukæmia, one of polycythemia. Cure was obtained in these three cases. In a case of sarcomatosis of an inferior extremity, which had been operated upon several times, we obtained a noticeable improvement.

M. BEGOUIN, Bordeaux. I have seen a case of cutaneous epitheliomata in the parotid region which could have been operated upon with great chances of success. The X-rays were employed instead. They failed, the patient came back six months after and the tumor then was inoperable.

In a second observation, the case was one of cancer of the breast in which the conditions were favorable for operation. The patient declined operation and was treated with the X-rays. For about a year conditions seemed to improve. She came back to us at about that time. The case was then inoperable. The knife should always be employed in the treatment of malignant tumors before using the X-rays. The only cases in which an exception may be made are cases of very superficial and thin cutaneous epitheliomata.

M. BÉCLÈRE, Paris. I would reproach to some who have taken part in the discussion that they have not completely read my report. As to the results, they are visible indeed. Owing to improved technique, accidents are less frequent than formerly. One mistake which seems to die hard is that the X-rays only exert a superficial action. In leukæmia, the gigantic spleens disappear rapidly under the influence of the X-rays. The X-rays never give birth to cancers. Chronic ulcers may at any time become epitheliomatous. Do not wait too long after the operation before applying the X-rays.

II. NERVE, MUSCLE, AND TENDON TRANSPLANTATION IN THE TREATMENT OF PARALYSIS

M. GAUDIER, Lille. I will consider in the first part of this report, such musculo-tendinous transplantations as are indicated in the treatment of infantile paralyses, be they spastic, be they flaccid. All transplantations can be classified under two heads: The transplantation of tendon to tendon, total or partial, and periosteal transplantation. In suturing tendon to tendon, it is preferable that either the whole or a part of the healthy tendon be sutured to the paralyzed tendon. The grafting of the paralyzed tendon upon an undivided healthy tendon has only exceptional indications. It generally gives unsatisfactory results. It is very important that the two tendons which are to be anastomosed be parallel in their course for as great a distance as possible. The tendons to be anas-

tomosed are selected only after a careful examination of the functional integrity of the muscles previous to operation and careful inspection of the muscles after the skin, fasciæ, and tendon-sheaths have been divided.

As suture material, the majority of surgeons prefer silk. Some use silk-worm gut, catgut, or silver or bronze wire. Immediately after the operation, the majority of surgeons make use of an immobilizing apparatus — most always a moulded plaster-of-paris splint which is replaced at a later stage by an orthopedic apparatus. The time during which this apparatus is to be worn is variable and is to be determined solely by the condition of the muscles, their functional integrity, and the solidity of the part or extremity. Electricity, massage, warm baths, and gymnastics are useful adjuvants to the operative treatment. All of these aids must be employed with caution. The patient must learn to utilize the new muscular conditions which the surgeon has created by the musculo-tendinous transplantation. In the musculo-tendinous transplantation, we have a therapeutic method of real value. The method must, to be most valuable, be employed with discernment. The results obtained by Vulpius are in the majority of cases very satisfactory, and superior, in cases of average severity, to these that can be obtained by arthrodesis or by the use of apparatus alone.

In periosteal transplantation, the healthy tendon is not anastomosed to a paralyzed tendon but is sutured directly to the periosteum or indirectly to the periosteum by a silken tendon. This periosteal attachment offers great resistance.

Nerve transplantation in the treatment of peripheral, facial, and infantile paralyses has given results. What can we expect of nerve transplantation in the surgical treatment of peripheral facial nerve paralysis, be it otitic or traumatic in origin. The ideal result would be to restore the parts to normal; clinically, transplantation cannot realize this result in the majority of cases, because the lesions are of long standing and have resisted all forms of medical treatment. We can overcome, more or less completely, the facial asymmetry and then, only during the period of rest. If the patient wants to obtain motion in the paralyzed side in case of spinal accessory and facial anastomosis, motility will be associated with motions of the shoulder of the same side.

Hypoglosso-facial transplantation enables one to avoid the inconvenient associations of motions of the face and of the shoulder, but in those cases where the trunk of the nerve has been completely cut, there persists lingual hemiparesis with atrophy. There will be temporary disturbance of deglutition and phonation. As to nerve anastomosis applied to paralyses of the extremities, 15 observations have been published to date. In 12 cases concerning the inferior extremities and of which we have a report, 8 have given satisfactory results. By satisfactory results, we mean a disappearance of the deformity and a return of muscular strength in the paralyzed muscle. In 4 other cases, the results were either not satisfactory or nil. For the upper extremity, two excellent results have been reported. We must always remember that the operation of nervous anastomosis must not determine new paralyses, owing to the lesions of the sound nerve. Economical procedures are to be recommended. Complete section of the paralyzed nerve must never be done. In infantile paralyses, nerve anastomosis is as yet a relatively new procedure. Musculo-tendinous anastomosis is a procedure of undeniable value.

M. Kirmisson, Paris. It is especially interesting to determine whether tendinous transplantation is really useful in the treatment of paralyses and to what extent we can count upon its efficacy. What makes difficult an exact appreciation of the value of tendon anastomosis is that in many of the reported cases complex operations have been performed. To the tendon anastomosis has been associated such operations as tenotomy, tendon-shortening, tendon-fixation. It is important that in the new cases to be reported in the future, that the late results be carefully noted, because it is not uncommon for an immediate result which appears brilliant to be transformed eventually into a complete failure. It would be important if the authors who have been most enthusiastic over tendon-transplantation could come to an agreement as to the true value of the methods employed. Can we depend upon a partial transplantation, or must we have recourse to a total transplantation? What are the exact comparative merits of transplantation of tendon to tendon? We must not forget the real aim of tendinous transplantation. It tends to restore not only the shape of the part but also the function of the part by transferring to the paralyzed muscle the action of the healthy muscle. If the patient is not able to perform those actions which he could not perform before the paralysis, if the shape of the limb has not been restored, we cannot say that a complete result has been obtained.

A good many of the partisans of plastic operations on tendons do not make use of arthrodesis; some say that this operation deprives the foot of suppleness and of elasticity, others say that there persists in the joint mobility interfering with good functional use. For my part, I con-

sider these two criticisms as not very well founded. I have performed 40 arthrodeses, some upon the foot, others upon the knee, and I have obtained satisfactory results. In those cases, where most of the muscles are paralyzed, I prefer to perform arthrodesis to the performance of complex operations upon the tendons, because it gives results far more advantageous and far more certain. Up to now, the exact value of tendon transplantation cannot be exactly stated. Exaggerations of its value have been published and it appears that results have been asked of the method which it really cannot give. Tendon transplantation is not a routine method of treatment in infantile paralyses. The primary indication is to correct vicious attitude by forcible correction, alone or associated with different plastic operations upon the tendons: tenotomy, tendon-shortening, tendon-lengthening. At a later date, the results may be improved by tendon transplantation. Tendon-transplantation finds its indications in cases of slight or moderate severity. In cases of great gravity, arthrodesis is the operation. In spasmodic paralysis, the indications of tendon transplantation are still more limited. The subject must be further investigated. In Little's disease, tendon transplantation does not seem to have any indications.

The results of nerve transplantations have not been under observation long enough and the cases reported too few in number to justify one in formulating a judgment as to the value of the procedure. It is possible that nerve transplantation will limit the field of muscle transplantation, perhaps completely supplant it.

M. HOFFA, Berlin. The aim in all tendon transplantation is to restore to the paralyzed extremity, first its normal shape and second its normal function. The failure is complete when these two aims are not realized. Complete failures are exceptional. They are due to four different factors:

1. Faulty pre-operative treatment. 2. Operation defectively planned. 3. Defective technique. 4. Incomplete complementary treatment.

The first step is obtained by the correction of the deformity and the contracture before the operation. The second consists in determining the condition of all the muscles, that is determining those that functionate and those that are paralyzed. The third is usually due to defective asepsis. I employ neither mask nor gloves. Previous to operation I boil the silk for ten minutes in a solution of one to a thousand bichloride of mercury. The skin is sutured with silk. The field of operation must be bloodless; Esmarch's bandage obtains this condition.

Transplantation of tendon upon tendon and transplantation of tendon upon periosteum are operations that complete each other. The grafted tendon must have a suitable degree of tension; This is obtained by tendon-shortening. The suture of tendon to the periosteum is the preferable method. The post-operative treatment is most important. Leave the limb hypercorrected from 6 to 8 weeks. Have the patient wear a removable orthopedic apparatus for at least 6 months. Make use of massage, electricity, and exercises. If all the muscles are paralyzed, resort to arthrodesis. In spasmodic paralysis, first tenotomize the spasmodic antagonist, then by anastomosis transfer its surplus of energy to the paralyzed antagonist. I see in Little's disease no appreciable advantage in tendon anastomosis over tenotomy, correction of existing deformity, and wearing of an orthopedic apparatus.

M. ROBERT JONES, Liverpool. I have performed 253 musculo-tendinous anastomoses. In my opinion, tendon anastomosis can accomplish the following results: 1. Can fortify a weakened muscular group; 2. Can overcome symptoms dependent upon complete paralysis of a single muscle or of a group of muscles; 3. Can lessen the predominating action of a muscular group in cases of spasmodic paralysis; 4. Can transform the action of a tendon that is acting faultily, for instance, in congenital club foot, the tendo Achilles can be transplanted to the outside of the calcaneum; 5. Can be an auxiliary in partial arthrodeses.

I have 51 times transplanted a tendon upon a tendon, 167 times transplanted a tendon upon the periosteum, 17 times sutured a tendon to bone, and I also have had 11 cases of muscular suture, 7 cases of transplantation of the tendon of Achilles to the ligament of the patella. Suturing the tendon to bone or to periosteum gives the best results. In cases of recurrence, post-operative treatment has been faulty. A transplanted tendon when once it has begun to functionate should never again lose its function. If there be a recurrence of paralysis, the tendon has undergone relaxation, has undergone overdistention; to avoid that accident, for several years the foot must be so fixed that the weight of the body cannot act upon it. A recurrence of the paralysis, in my opinion, is always due to the surgeon's negligence.

I attribute my failures to the following causes:

a. Defective tension of the reinforced muscle. *b*. Insufficient pre-operative correction of the deformity. *c*. Too rapid adhesions to the surrounding tissues of the transplanted tendon, insufficient liberation of the tendon. *d*. Excess or absence of tension of the transplanted tendon.

Patients under five years of age I do not operate.

In them the operation can with advantage be postponed. Some time previous to operating, by manipulations, by apparatuses, or by tenotomy, I correct the deformity and keep the foot in the position of hypercorrection.

As to the technique of transplantation I preserve, when possible, the tendon-sheath. In 10 cases of spastic paralysis I have performed tendon anastomosis. I have in four cases transplanted the flexors of the wrist upon the extensors. In six cases, I transplanted the biceps or the semimembranosus upon the patella. In 15 cases of congenital club foot, I transplanted the inner half of the tendo Achilles to the outer border of the calceneum and the tibialis anticus to the external border of the foot. In this series, I obtained 12 satisfactory results. Do not transplant until at least 2½ years have elapsed from the beginning of the paralysis. Failures must be avoided by

1. Correcting all deformity before transplanting.

2. Removing a cutaneous flap so as to be sure that hypercorrection will be maintained.

3. Suturing the tendons firmly to periosteum or to bone.

4. Maintaining the position of hypercorrection until voluntary motion is noted in the tendons.

5. Seeing that during locomotion the transplanted tendon is not subjected to the body-weight.

M. F. LANGE, Munich. In tendon anastomosis, success depends, first, upon the adoption of a simple, uncomplicated operative technique and upon the observation of a rigorous asepsis. I employ strong curved, round needles, My thread is boiled in a solution of bichloride, one to a thousand, and then soaked in paraffine.

I have performed periosteal transplantations for the last ten years. To secure abduction of the lower extremity, I detach from the great trochanter the upper end of the vastus externus, which I then with the aid of 8 or 10 long silk sutures unite to the iliac crest. Adhesions are responsible for many failures. The transplanted tendon adheres very firmly to bones, to ligaments, to fascia, and to tendon-sheaths. To avoid these adhesions, you must transplant the connective and adipose tissues which surround the muscles, the tendons. You must be careful not to injure the tendon-sheaths. If adhesions be formed, a secondary operation will be necessary. To prevent adhesions, it is well to place adipose tissue between the transplanted tendon and the contiguous bone or fascia.

M. OSCAR VULPIUS, Heidelberg. I do not want to combat arthrodesis. In some cases it is necessary. It should not be compared with tendon transplantation. It has different indications. Often failures in tendon transplantation are due to unwise selection of cases. In my opinion premature operation is criminal. Never operate until the paralysis is of at least one year's standing. A well-conceived operation avoids failures. The electric examination is important. An exploratory incision is not harmful. I prefer total transplantation to partial transplantation, but if it be not feasible, partial transplantation is possible; or an antagonistic muscle may be utilized. Artificial tendon is indispensable only in a few cases, the paralyzed tendon offering enough solidity for the sutures. The periosteal method, I use only for fixation of the quadriceps.

Recently, I saw a tendinous transplantation which I performed upon the extensor communis digitorum four years ago. The result was irreproachable. Can a partial transplantation be used so as to divide the function of a muscle? The numerous successful anastomoses of the anterior tibial and of the extensor communis digitorum enable one to answer that question in the affirmative. Can antagonistic muscles change their functions? Can a flexor become an extensor? Yes. I can show many cases where the biceps femoris extends the knee. Can a partial transplantation of an antagonistic muscle succeed? Again, I answer yes. For instance in a young Frenchman, one of my patients, half of the triceps acts as a flexor of the elbow, the other half continues its role of extensor of the forearm on the arm. The results have not always been lasting, but that does not speak for rejection of the method. The failures are due to

1. Unwise selection of cases.
2. Faultily conceived operation.
3. Defective technique.
4. Inefficient post-operative treatment.

Most recurrences occur in the destitute because they are deprived of post-operative treatment.

M. D. GIORDANO, Venice. My patient was two months and a half old when I first saw him. There was a tumor the size of an egg in the lumbar region. This increased so rapidly in size that a rupture was feared. When I first saw the patient, this tumor was the size of a fetal head. It was not reducible and it became tense when the patient cried. Bilateral club foot. Operation for spinal bifida was successful. Incontinence of fæces and urine persisted. Deformity of the foot increased. I saw the patient again at the age of 7½ years. There had been physical and mental development but the deformity persisted and there was incontinence of fæces and of urine. I resolved to establish competent sphincters. Since an exclusively nerve transplantation would have been too

delicate, I decided to make a transplantation of muscle and nerve. By transplanting together a portion of both obturator internus muscles, with filament of the obturator nerve, I succeeded in establishing continence of urine and continence of fæces. I cured the club foot by lengthening of the tendon of Achilles and by transplanting the peroneal tendons to the Achilles tendons.

M. WILLEMS, Gand. I have performed 21 tendon transplantations in cases of paralytic club foot, varus or valgus, and I must acknowledge that my later results are not as brilliant as those obtained by my German colleagues. In 16 cases, I have had 15 recurrences. Discouraged by these failures, I have lately resorted to fixation of the paralyzed tendons, and the end-results are excellent. I simply fasten the tendons upon the bone by inverted U-shaped nails.

M. CH. GIRARD, Geneva. In four cases of spino-facial nerve anastomosis which I have performed, the first three were end to end anastomoses. The fourth was a termino-lateral anastomosis. I have been able to keep under observation the three last cases. I have had improvement in all but not complete successes. We know that adhesions and cicatricial hypertrophies can form around the outer portion of the nerve and thus compromise results. It is necessary to protect the suture from compression. It has been recommended to cover the nerve at point of suture with fatty or muscular tissue, to conceal it in a decalcified bone-tube, or in a tube of formalized gelatine, or in a dog's artery, hardened by formaline.

In a case in which I liberated the median nerve from a compressing mass of connective tissue, for protection of the nerve, I surrounded it with a small piece of gutta-percha tissue. Recovery was complete and permanent.

The paralysis of the tongue, palate, or of the trapezius following hypoglosso or spino-facial anastomosis is not an insignificant accident, and we must endeavor to avoid it. I never make total division of the hyperglossal nerve.

M. VIDAL. I have performed a spino-facial anastomosis upon a young lady. The result was incomplete and not brilliant. The second case was a case of obstetrical paralysis. The patient was three years old. I anastomosed the hypoglossal nerve to the facial nerve. The results were good; the operation, however, was laborious and difficult.

In enucleating a cystic goiter the recurrent laryngeal nerve was cut by one of my associates. There followed a paralysis of the corresponding vocal cord. I later implanted the recurrent laryngeal nerve in the thyroid body. I did not expect a success, but at the end of 7 months there was a disappearance of the paralysis of the recurrent.

M. PEUGNIEZ. I have anastomosed the facial nerve three times with the spinal-accessory, once with the hyperglossal nerve. My first patient of spino-facial anastomosis maintained a complete recovery. My second shows marked improvement. The improvement continues but the restoration of function is not complete. In my third case, not being able to find the spinal accessory nerve, I made use of the hyperglossal nerve and the result was very satisfactory. I was equally successful in my fourth case. A fifth patient had paralysis of the deltoid. I anastomosed the circumflex with the musculo-spiral nerve. There was complete restoration of function.

M. P. REDARD, Paris. Muscular tendinous transplantation is a method of value. It does not often give complete restoration of muscular equilibrium and of muscular power, but usually there is improvement of motion and the deformity remains cured. Tendon transplantation is indicated particularly in flaccid, incomplete paralysis. In paralytic club foot, the results are not satisfactory when many muscles are involved. Transplantation upon the periosteum will be found of value chiefly in those cases where tension of the tendon of the paralyzed muscle must be avoided. It is of value too, especially in supination and pronation of the foot. It often has to be performed in paralysis of quadriceps femoris and in paralyses of the upper extremities. In Little's disease and in the various spastic affections, tenotomy is done in many cases. First correct the malformation; later you can make what transplantation you judge necessary.

M. DELAGÉNIÈRE, Le Mans. In talipes equino-varus, I perform in some tenotomy of the tendon Achilles; in others, the more extensive Phelps-Kirmisson operation; in others, arthrodesis. At times, we perform one operation; but far more frequently we combine several of the operations. The section of the tendon of Achilles combats the equinus, but compromising the extension of the foot upon the leg. Phelps' operation overcomes but incompletely the vicious inward inversion deformity of the foot. Astragalectomy and more or less extensive tarsectomy find their indications in adults in those cases where the astragalus is very prominent. I have performed thirteen tendon transplantations, the results of which were satisfactory in 11 cases.

In talipes equino-varus, it is our opinion that tenotomy of the tendon Achilles should be supplemented by the transplantation of the proximal

divided end of the tendon Achilles upon the tendon of the peroneal longus.

M. MENCIÈRE, Reims. Tendon grafting, — what is its value? It must be combined with operations upon the skeleton, upon the joint capsules, but its action is not disputable. I show you here the photograph of a child 10 years old, where the transplantation of the trapezium has very well supplied the function of the paralyzed deltoid. Post-operative treatment is of the greatest importance.

I have performed 260 operations for various paralytic deformities. Ten per cent of all cases are incurable, consequently no treatment need be suggested for them. Seventy per cent of the cases are either curable or curable to a marked degree. In 20 per cent of the cases, the deplorable conditions of the patient is improved, though no cure is restored.

M. PÉRAIRE, Paris. Musculo-tendinous transplantation in infantile paralysis is valuable. To secure success, hasty operations should not be performed. You must only attempt to restore the function of the muscles that are totally paralyzed. Thorough familiarity with the operative technique is essential. Post-operative treatment is important. In many cases, only the deformity is overcome, the function of the muscle not being restored. The things to which are attached the most importance are, asepsis, anesthesia, the use of the Esmarch bandage, and the correct employment of plaster of paris. We have divided the cases into simple and complicated cases of infantile paralysis. The technique in these cases differs markedly. The surgeon after careful examination of his patient, must determine whether the tendon must be lengthened or shortened. I am opposed to tenotomy. In cases of infantile paralysis, associated with osseus and articular deformities, in addition to operations on the tendons, operations upon the skeleton are indicated. Among these operations, those most frequently employed are astragalectomy, cuneiform osteotomies, and tarsectomies.

IN CONCLUSION

KIRMISSON said, I will not add anything to what I said in my opening remarks. I am firmly convinced that tendon anastomoses give far better results in traumatic than in infantile paralyses. Tendon anastomosis can only be considered an adjuvant treatment in infantile paralyses.

III. MISCELLANEOUS

INJECTION AND IMPLANTATION OF PARAFFINE INTO THE TISSUES

M. H. ECKSTEIN, Berlin. It is known that the injections of soft paraffine have disadvantages. Hard paraffine is never followed by undesirable complications. It is a purer substance and is better tolerated by the tissues. The skin must be supple, elastic, mobile. To obtain that you have to mobilize the skin with scissors after having incised it. Hard paraffine is liquefied at a temperature of 75° centigrade. I use Broechaert's or Mahu's syringe. The injection is made cold.

This method gives excellent results in rhinoplasty. It can also be used with advantage to elevate depressed scars.

M. BROECHAERT, Gand. I am an adept enthusiast of the injection of solid paraffine. The few accidents that have been reported cannot be attributed to the method; faulty technique or impurities in the paraffine are responsible. With paraffine I have restored over 200 noses and some very beautiful esthetic results have been obtained.

MELANOTIC TUMORS TREATED WITH ARSENICAL PASTE OF CZERNY

M. J. REVERDIN, Geneva. Reverdin reports two cases of melanotic tumors treated with the arsenical paste of Czerny. Melanotic tumors are usually exceedingly malignant. In a patient 90 years old, I treated an epithelioma of the ear and a melanoma of the cheek. I used Czerny's formula, containing arsenic compound with orthoform. The epithelioma was not influenced. The melanotic tumor of the cheek was cured. In another case, upon a patient 48 years of age, I used the same treatment for an exaggerated melanic stain of the cheek. Below it was a small pedunculated tumor. This application caused depigmentation of the tumor and then cure was obtained. These cases are two years old.

EXPERIENCE WITH ANTI-CANCEROUS VACCINE

M. DOYEN, Paris. My experience with anti-cancerous vaccine by the employment of attenuated cultures of the micrococcus neoformans dates back 7 years. Numerous patients have been treated, 3, 4, 5, and 6 years ago. Other favorable reports concerning the vaccinal action of the micrococcus neoformans have just been published in London. Among the successful results, are 2 cases of laryngeal cancers, which were treated with vaccine prepared by Prof. Wright. Prof. Wright obtained his first results with cultures coming from my laboratory. To-day, we are going to compare the

effects of anti-cancerous vaccination with the mode of action of the different physical agents of acknowledged activity against superficial and easily accessible cancerous lesions; for instance, the Rœntgen rays and radium. How do these forms of local treatment act? Numerous histological examinations have shown that the curative process is identical whatever be the agent employed. There is first a tumefaction of the cells, the outline of which becomes indistinct, the chromatin of the nucleus undergoes fragmentation and loses the faculty of taking up stains, then necrosis ensues. The presence of a large number of migratory cells shows the influence of phagocytosis in the curative process. There is one thing that has been well demonstrated. It is that these different physical agents only act superficially and are incapable of affecting the vitality of cancerous cells located at even a moderate distance from the surface.

We have seen that the prolonged action of X-rays upon deep cancers, after having been followed by indisputable improvement, frequently provokes rapid generalization of the cancer. These accidents of rapid aggravation must be attributed to the alterations induced by the X-ray exposures in the lymphoid tissues. These lymphoid tissues are centers of defense against all external agents, organic or inorganic. We know that the lymphoid tissues are very sensitive to the noxious action of the X-rays. We know that certain sarcomata when deep, are particularly sensitive to radiotherapy.

Some sarcomatous cells offer less resistance to the X-rays than the lymphoid tissue cells. Following the vaccination with attenuated cultures of the micrococcus neoformans, we see the same cellular changes that follow exposure to the X-rays and other physical agents employed against cancer. Cellular necrobiosis, digestion of cellular debris by the phagocytes, the process of repair is always the same. Whatever be the nature of the lesion, be it a simple or an infected wound, a furuncle, a tuberculous lesion, be it a cancerous nodule, the human organism disposes of only one defensive process, phagocytosis. Chemiotaxis is positive or negative. When the army of pathogenic microbes multiply, the leucocytes begin the fight, and leucocytic victory results in cure, leucocytic defeat results in death.

Spontaneous destruction of the cancer cells by the phagocytes is exceptional. In fact, the polynuclear leucocytes which destroy so easily the micrococcus neoformans in the free state are incapable of destroying the cells which harbor it as a parasite, and even the macrophages are practically inactive in its presence.

Certain individuals possess a relative immunity against cancerous infection as can be observed in atrophic scirrhus cancer which is a cancer of slow evolution.

Is it possible to provoke artificially these phenomen a of regression? The problem does not seem incapable of solution. Cancer must be treated by local and by general measures. Extirpation with the knife is the favored treatment. Operation, though performed early, has given many disappointments. The frequency of rapid recurrence after apparently very complete operations, shows that cancer cannot be treated even in its beginning as a purely local affection. The cells through which repair of the operative wound is effected are powerless to devour the few cancerous cells that mayeescape from the tumor, and consequently these tumor-cells will graft themselves in the operative wound. Many patients, a few months after the removal of a cancer, are in far worse shape than if the tumor had been unchecked. Surgical intervention seems to have propagated the affection to the healthy tissues that limit the operative field. It is necessary that by an increased phagocystosis the resistance of the cancer cells be limited. All the local measures that are now employed against cancer, as for instance X-rays, radium, electric sparks, only produce a minimum effect, only slightly diminish the vitality of the cancer cells. It is indispensable to aid these agents with general treatment.

The resources which I employ against cancer are the following: Anti-neoplastic vaccination with cultures of the micrococcus neoformans. These vaccinations should be employed preventively in cases where there is a probability of cancerous degeneration. These vaccinations are employed without exception in all cases of cancer in which the diagnosis is positive. Second, the operation must not be performed before having subjected the patient to a series of immunizing infections. Third, the vitality and the virulence of cancerous cells, especially in cases of superficial lesions, must be lessened by physical agents of known activity, such as the X-rays, radium, electric sparks, either of high frequency or of great intensity, etc.

STATISTICS OF STOVAINE SPINAL AND COCAINE SPINAL ANESTHESIA

M. SABADINI, Alger. I have used stovaine spinal anesthesia in 156 operations. The cases have been of a varied nature; hernia, osteomyelitis, appendicitis, vesical calculi, ovarian cysts, prolapsus of the rectum, etc. Duration of the anesthesia varies from 15 minutes to an hour and a half. In 4½ per cent of the cases, no anesthesia

was obtained. This lack of anesthesia is noted especially in neurotics and in alcoholics. The immediate accidents were headache and vomiting, and were of slight significance. Of late accidents, there were none. We always use Billon's stovaine. The dose varies from 5 to 10 centigrames. We have never had a death. Our conclusions are the following:

Stovaine spinal anesthesia is a good method. Like cocaine spinal anesthesia, it can be employed without danger from the 15th year up. The dose of stovaine to inject varies from between 5 to 10 centigrams. The anesthesia lasts up to one hour and a half. Unpleasant accidents are of less significance and of far less frequency in stovaine spinal anesthesia than in cocaine spinal anesthesia. One disagreeable effect of spinal stovaine anesthesia noted was the retention of urine. This occurred 44 times in 146 cases. This retention varied from one to several days. This inconvenience we have not noted in cocaine spinal anesthesia.

MIXED ANESTHESIA, OBTIANED BY SCOPOLAMINE, MORPHINE, AND CHLOROFORM

M. CAZIN, Paris. In 243 operations one hour before beginning choloroformization, I injected a half a milligram of scopolamine and a half a centigram of morphine. I have never observed the slightest accident. In a general way, I can say that I have obtained more satisfactory anesthesia than if I had employed chloroform alone. I find the method especially valuable in impressionable patients. In them, the injection of scopolamine-morphine calms the apprehension and to a sensation of fear succeeds apathy. They do not seem to concern themselves with what is going on around them.

There is one thing positive and that is that scopolamine has marked action upon the heart. We think that in big doses its action upon the heart is dangerous. We would never give more than a half a milligram of scopolamine, and we think that it is desirable to even lessen that dose.

In the discussion which followed, several surgeons reported cases in which they had operated with scopolamine alone.

WOUND OF THE LUNG; PROBABLE WOUND OF THE HEART; IMMEDIATE OPERATION

M. RAYMOND, Paris. The patient was brought to the hospital in a collapsed condition. He had a gun-shot wound of the chest, small externally, and slightly above the left mamma. The diagnosis was hemo-thorax; probable wound of the heart.

We turned back a flap of the chest wall, containing the fourth, fifth, and sixth ribs. The pleura was opened, the lung had been perforated. Pulmonary haemostasis. After displacing the pleural cul-de-sac outward, we incised the pericardium. There was a contused wound of the left ventricle. It was not perforating, however. We did not think it useful to suture the wound. No pericardial drainage. We drained the pleura. This occurred three years ago. The patient has remained cured.

M. REVERDIN, Geneva. I have employed the technique used by Raymond and have been satisfied with the rapidity with which one can obtain access to the lesion. In my case, unfortunately, the pulmonary artery had been perforated and the patient died on the operating table.

M. ZAWADSKI, Warsaw. I have had occasion to operate on 3 cases for wounds of the heart. In the first operation the pericardium was attacked. I sutured the pericardium. Recovery followed. In the second patient, there was a deep wound of the right ventricle. It was a stab-wound. I sutured. The patient lived 17 days and died of pneumonia.

The third case was an alcoholic, who while in a state of intoxication received a wound in pit of the stomach. The patient was in a state of collapse, pulse 180 filiform. Area of transverse dulness of the heart increased. Heart sounds feeble, anguish extreme. Extreme secondary anemia. I operated under ether anesthesia. I sutured the heart and also sutured the pericardium and placed a drain between the pericardium and muscular cutaneous flap. The patient lived, doing well for 15 days. On the 15th day, a visitor brought, unknown to the nurses, a quantity of wine and alcohol, which the patient drank. This was followed by vomiting and this by hemorrhage and death. The post-mortem showed that the two pleural cavities were intact. There was a suppurative inflammation of the pericardium. Sutures in the pericardium had yielded. There was a softening of the heart muscle in the neighborhood of the pericardial sutures. Death was due to cardiac rupture. (The heart was presented.)

I will conclude as follows: 1. In suspected wounds of the heart one must not hesitate to operate. Hemopericardium is not a contra-indication. These patients stand ether anesthesia well. Good exposure is obtained by removing from 6 to 9 centimeters of the 5th and 6th ribs, and by making temporary resection of the fourth. The pleural cavity is not to be opened. To stop the hemorrhage, which is always profuse, it suffices to displace the heart upward and a thing which is very interesting, the inferior portion of the heart can be compressed without stopping the function

of the heart. The continual activity of the heart may lead to infection if the wound be not entirely closed.

CONCERNING OVARIAN CASTRATION IN INOPERABLE CANCERS OF THE BREAST

HENRY REYNES, Marseilles. Four years after, recurrence. Failure of fulguration, that is of high tension electric sparks.

On the 20th of May, 1903, I performed a complete utero-ovarian castration in a young woman 32 years of age. This young woman was childless and had an inoperable bilateral cancer of the breast. Cancer was adherent to the thoracic wall. The auxiliary glands were involved on both sides. There was cachexia. The diagnosis of carcinoma was confirmed by Cornil. The effects of castration were remarkable from the local and from the general standpoint. There was a spontaneous healing of the ulcers, the tumor retroceded, and there was an atrophy of both breasts. For 3½ years the result was very satisfactory. Then recurrence occurred in both breasts. Despite X-ray therapy the disease progressed, and last February there were numerous cancerous ulcers on the right side involving the thoracic wall. These were present in the hard and in the soft tissues. On two occasions the cancer was curetted and subjected to high frequency and high tension sparks. The treatment proved inefficient. This interesting patient died on the 12th of July, 1907, due to cancerous cachexia four years after castration.

M. PSALTOFF, Smyrna. Three years ago, I did two total abdominal hysterectomies for cancer of the breast. The result of these operations was not encouraging. In the first case, owing to the involvement of the lymphatic nodes, the patient was thought inoperable by the usual methods, and we thought it would be a good case for abdominal hysterectomy and castration. We removed the uterus and adnexa. The operative recovery of the patient was uneventful. Two months after she died from the extension of the process.

The second patient presented a large tumor of the left breast. The lymphatic nodes were involved. The tumor was adherent to the thoracic wall. The tumor was inoperable. The uterus was removed with the adnexa. She made an uneventful recovery from the operation, but the tumor was not influenced in the least. Four months after she died. We think that it is well that all these cases be recorded.

THE EXCLUSION OF THE PYLORUS IN THE TREATMENT OF PYLORIC ULCER

M. JONNESCO, Bucharest. This was first suggested and employed by Von Eiselsberg. In the 4 cases which he reported (in 1895) 3 were markedly benefited by the operation; 1 died of hemorrhage 8 months after. In 1906 and 1907, I operated on 9 cases of pyloric and duodenal ulcers by this method. There were no operative deaths. One patient died on the 8th day of a severe intestinal hemorrhage, due to arteries at the base of the ulcer. Therapeutic results in all the above cases were excellent. All the symptoms rapidly disappeared, pain and the hemorrhage, the chemical composition of the gastric juice was always favorably influenced.

Exclusion is indicated in all spreading pyloric ulcers when pylorectomy is impossible. It is preferable to gastro-enterostomy, which has shown itself powerless against pain and hemorrhage and which has shown itself also incapable of modifying the chemical composition of the gastric juice. All those disturbances which are favored by the presence of the ulcer are largely influenced and stopped by exclusion of the pylorus followed by gastro-enterostomy. This operation prevents the ulcer from causing any harm and allows it to evolute towards a cicatrization.

The operative technique is immediate median supra-umbilical laparotomy, separation of the gastro-iliac and gastro-hepatic ligaments. Ligation of the coronary arteries along the greater and the lesser curvature. On each side of the future resection of the stomach, place curved forceps so as to prevent the escape of gastric contents into the peritoneal cavity. Resect the stomach with strong scissors. The pre-pyloric orifice is closed first, then the stomachic orifice. Close with three layers of sutures; one mucous, one musculo-serus, and the third is a sero-serus suture. Retrocolic gastro-enterostomy does not consume over 30 or 40 minutes.

STENOSIS OF THE PYLORUS, GASTRIC INANITION. GASTRO-ENTEROSTOMY, CURE.

M. VORONOFF, Cairo. This patient had frequent hematamesis for the six months which preceded operation. Symptoms of pyloric stenosis and spasm of the pylorus then appeared. Intolerance of food became more and more marked. In the last two months the patient could not even keep a few mouthfuls of water. The operation was performed at a time when the patient seemed on the verge of death from inanition. Precolic anterior gastro-enterostomy was the operation performed. Feeding began the second day after the operation. Complete disappearance of vomiting and of pain. Rapid return to health. Two months after operation the patient resumed her usual occupation.

A CONTRIBUTION TO THE STUDY OF TETANY AND OF CONTRACTURES OF GASTRIC AND INTESTINAL ORIGIN.

M. SCHWARTS, Paris. The patient entered my service; the diagnosis was gastric ulcer. This patient had painful contractures of all the abdominal muscles. These contractions were intermittent. There had been an aggravation for the last 6 months. I did an exploratory laparotomy and gastro-enterostomy by von Hacker's method. Its result was almost a resurrection for this patient. There was an immediate and complete disappearance of the abdominal contractures. On the 7th day this patient developed pneumonia and died on the 11th day. Post-mortem showed that there were in the duodenum several healed ulcers and one spreading ulcer which had destroyed the mucosa extending as far as the muscular layer.

BILIARY LITHIASIS; 16 KEHR OPERATIONS.

M. PAUCHIET, Amiens. Every case of biliary calculi should be operated. Elimination by the natural channels should not be sought as there is a danger of producing a permanent biliary retention, owing to appearance of calculus in the common duct. Acute calculous cholecystitis, with muco-purulent distention of the gall-bladder, will be treated with cholecystostomy. Chronic calculous cholecystitis, should be treated by cholecystectomy. Lithiasis of the common duct must be treated by the operation of Kehr. In non-icteric patients the operation has a very low mortality. The icteric patients often die of extreme icterus or of hemorrhage. In two-thirds of the cases of stone in the common duct, jaundice is absent.

I have practiced 16 operations with 3 deaths. I believe that in all cases of simple cholecystostomy, the biliary channels should be catheterized. Calculi may have been overlooked in the common duct. In draining the hepatic ducts, the subhepatic space must be tamponed and the wound of the common duct must be kept open for secondary elimination of biliary calculi. In feeble subjects, drain the hepatic ducts and the common duct. The latter drain will go into the duodenum and will allow the injection, in spite of vomiting, of sweetened water and of bile.

SPONTANEOUS RUPTURES OF THE GALL-BLADDER

M. MAIRE, Vichy. The first case is that of a patient 63 years old. She gave no history of gall-bladder disturbance. A phlegmon of the abdominal wall, the center of which corresponded to the umbilicus, developed. While scrubbing the field, previous to the operation, the wall ruptured and a few gall-stones escaped. The gall-bladder, cystic duct, a part of the great omentum, and a portion of the abdominal wall were removed. The gall-bladder contained 383 calculi. Recovery. The second case is that of a patient 56 years old, who gave a history of gall-bladder disturbance. In this case, the gall-bladder spontaneously ruptured and flooded the abdominal cavity. He died. The diagnosis was made but the patient could not be operated on until 10 days later. As symptoms of rupture of the biliary channels, I consider important a belt-shaped area of intense pain, occurring during an attack of biliary colic, with the appearance of jaundice of all teguments and gradual subsidence of the pain.

APPENDICULAR ILIOPSOITIS

M. LARDENNOIS, Reims. I report 2 cases of appendicular iliopsoitis. In one of them, the patient had four recurring attacks of suppurative psoitis without a sign of appendicitis. The removal of the vermiform appendix showed that the extremity of this organ penetrated under the iliac fascia and was in direct contact with the muscular fibres. It is unusual to have a left-sided psoitis. When it does occur, it occurs chiefly in women and is secondary to pelvic suppuration.

I wish to state that psoitis is usually due to an extension of an inflammatory process. This inflammatory process is almost always a latent appendicitis — an appendicitis which has not been diagnosed because it is retrocaecal. Since psoitis is usually of appendicular origin, the surgeon will not only drain the suppurative focus in the psoas, but will also suppress the causal affection, that is, the appendicular focus.

LIPOMA OF THE PELVIS OF THE RIGHT KIDNEY

M. CROISIER, Blois. For the last two months this patient had daily profuse hematuria. She was extremely anemic. The entire right side was the seat of pain. The right kidney was lowered and big. No other symptom was present. The urine examined microscopically showed numerous red blood corpuscles and also a large number of staphylocci en masse. There was nothing to lead one to suspect tuberculosis or cancer. The patient was 34 years old. Her condition necessitated an intervention, though no positive diagnosis could be made. Such a vague diagnosis as a renal tumor was permissible. At operation, upon the posterior surface of the kidney was seen a lipoma, the origin of which was the anterior wall of the pelvis. This lipoma traversed the pelvis. The tumor was removed. The point

of implantation was cauterized and the defect in kidney tissue was obliterated by sutures. The patient entirely recovered, hematuria disappeared immediately, the urine ceased to contain pus on the 8th day. An isolated lipoma is a rare occurrence in the pelvis of an otherwise healthy kidney.

VAGINAL HYSTERECTOMY FOR FIBROMATA

M. LeBec, Paris. I have performed 490 hysterectomies for fibromata; 310 abdominal and 180 vaginal. Although vaginal hysterectomy has lost its popularity, it still has indications. For instance, in all fibromata, the upper border of which does not extend beyond a point midway the symphasis pubis and the umbilicus, it gives a rapid cure. It avoids the abdominal cicatrix and does not expose to hernia formation. In 180 vaginal hysterectomies, I had 10 deaths. They were due to the following causes:

Two from hemorrhage, 3 from exhaustion, 3 from acute septicemia, 1 from emboli, 1 from uremia.

DIAGNOSTIC ERRORS DUE TO FAULTY INTERPRETATION OF X-RAY SKIAGRAMS

M. J. L. Championnière, Paris. The interpretation of X-ray pictures may give birth to errors. They may be poorly made, and thereby deform the object the same as a simple photograph can give a modified resemblance. Even with the best intentions and best environments on the part of the operator, we must acknowledge that the X-ray picture is profoundly modified by the situation of the bulb and the distance of the plate from the body. This led to the adoption of general rules for the situation of the bulb and the distance of the plate. But it is difficult to apply these rules to a focus the limits of which are difficult to precisely circumscribe. In some cases, the diagram may not show the fracture line. I have seen several fractures of the fibula in which this accident occurred. In some cases, it was only by repeating the exposures that the fracture was discovered. In some few cases, the rays did not show the fracture-line, though the symptoms were very characteristic. The transparency of the callus may explain some errors. If the X-ray picture is in contradiction with the symptoms, the cause of this contradiction must be determined and the exposures must be multiplied. To diagnose a fracture, you must get a definite line. A simple shadow is not sufficient. The causes that can cause projections of shadows are multiple.

TREATMENT OF ARTICULAR AND OSSEOUS TUBERCULOSIS

M. Mencière, Reims. I believe that local treatment is very efficient and I think it is essential. Sea shore and altitudes are only of secondary importance. I wish to insist upon the fact that the physician must be convinced that local tuberculosis is curable. There is no specific climate. Intra-articular and interstitial injections of the solution of iodoform in ether and phenolization are important measures. I report 86 cases, 23 consecutive cases of injection of iodoformized ether, with 23 cures; 63 observations of phenolization and phenopuncture with or without iodoformized ether injections. Nine cases I will not consider for diverse reasons. There remain 54 observations with 51 cures and cured without shortening. We must deduct 14 cases in which the method was employed for lesions other than joint tuberculosis. There remain 37 cases of joint tuberculosis. In these 37 cures, there were 15 cases of cure with remaining motion.

THE DIFFERENT VARIETIES OF CONGENITAL DISLOCATION OF THE HIP

M. Froehlich, Nancy. I divide the so-called congenital dislocations of the hip into three groups: 1. Congenital traumatic dislocation with normal cavities. 2. Teratologic dislocations. In this case there is primary malformation of the joint. This is the most numerous group. 3. Pathological or acquired dislocations.

In the first dislocations, enter all those that are produced during the intra-uterine period. They may be due to uterine compression; may be due to the presence of a limited amount of liquor-amnii; may be due to an exaggerated abduction of the femur and to the action of the pelvic-crural muscles, completing the displacement. Fall of the mother upon her stomach can dislocate a fetal femur. The dislocation may occur during delivery.

In the second class are included all those cases where there is an atrophy or a complete absence of the acetabular cavity, hence impossibility or a difficulty for the femoral head to lodge therein.

In the third class, the author includes all dislocations that are produced in the first months after birth, following arthritis of the hip joint; for instance suppurative arthritis, arthritis deformans, osteomyelitis of ilium, or of neck of femur. In the first class perfect cure is obtained as a rule. In the second and third groups cures are less frequent, improvements are numerous, there are failures.

I base this classification upon 74 personal cases, 23 of the first, 51 of the second, and 12 of the third group. This classification is based chiefly upon skiagraphy, clinical study, and therapeutic results.

M. Calot, Berck. It is necessary to begin to give congenital hip dislocation attention soon after

birth. By operating as soon as the diagnosis is made, constant and complete cures can be obtained. To support my opinion, I have the pleasure of presenting 30 or 40 children which I have operated upon for congenital hip disease and who walk and jump so perfectly that it would be impossible to recognize any trace of their former deformity. I show you at the same time the X-rays taken before and after treatment.

RATIONAL TREATMENT OF CONGENITAL HIP DISEASE

M. LEDAMANY, Rennes. The mobilizing apparatus employed by Lorenz and his imitators must be improved and completed by a mobilizing and corrective treatment. I present for your consideration an apparatus which realizes these two aims. Through mobilization the cotyloid activity is more quickly and more deeply hollowed. After the correction of the causal defect, relaxation becomes impossible. The only disadvantages of this new method are that it requires a special apprenticeship and special tools. The results are far better than those secured by other forms of treatment.

M. JUDET, Paris. Since 1902, I have operated on 50 cases of congenital hip disease. At the onset, I made use of Brun's three-step operation. I treated 19 cases. I obtained 11 anterior transpositions, 7 anatomical reductions, and had one failure, but the results which I obtained by the method which I am going to expose are very much better, and in the treatment of 18 cases I had 17 anatomical reductions and 1 anterior transposition. This series concerns children from 3 to 6 years old, showing complete dislocation and a shortening of from 3 to 4 centimeters. They are the most favorable cases. These patients have all been cured by a single apparatus which was removed at the expiration of 5 months. This plaster-of-paris apparatus immobilizes the femur in a position of flexion (90°) upon the pelvis, and an incomplete abduction 60°. I do not rupture the adductors. After a stay in the apparatus for a few months, the young patient begins to walk.

This method is applicable in single and in double dislocations. After these latter have been immobilized for 5 months, the patient can begin to walk at the close of the 6th month, and be completely cured in 8 months. The X-rays which I pass around illustrate successful cases.

In children from 6 to 12 years of age, two apparatuses must be used. The first apparatus will maintain the limb in flexion abduction and outward rotation; the second keeps it abducted and internally rotated.

THE ATROPHIC LENGTHENING OF THE BONES OF THE INFERIOR EXTREMITY IN TUBERCULOSIS OF THE KNEE IN CHILDREN.

M. BARBARIN, Paris. Outside of the vicious attitudes, caused by a muscular spasm, the deviations from the normal of the inferior extremities in tuberculosis of the knee, are due either to destruction or to atrophy of the femoral epiphysis. If we examine these knees with X-rays at the onset, it will be noted, in the majority of the cases, that the femoral and the tibial diaphysis are thinned, while the diseased epiphysis are broader than normal. This atrophic lengthening, as it was called by Ollier, may be minimal, or may be very marked. Ollier, among many others, has reported cases of lengthening of the inferior extremity following tuberculosis of the knee. Menard, Burnoir, in 20 observations noticed an increase in length of the femur or of the tibia in 17 cases. In 32 cases of tumor albus, there was lengthening in 20 cases. This lengthening is usually of several millimeters. Bourganel has recently published a case where the lengthening was 4 centimeters.

I can show you the X-ray of a child of 3 years, where the lengthening was 3 centimeters. This lengthening usually involves the femur. How can this epiphyseal overgrowth be explained. To me, the following explanation appears the best: The epiphysis being congested and irradiated, the dia-epiphyseal cartilage becomes the seat of more rapid bone production. If this abnormal growth influences the entire epiphysis there will be an increase in the lengthening of the extremity, but there will be no deviation of the limb. If this abnormal growth involves only the internal condyle of the femur, genu valgum will result. In all cases, the knee must be fixed and protected. Radiography will inform the attending physician as to the condition of the epiphysis and will direct bim as to the choice of apparatus.